The Journal of Obstetrics and Gynæcology of the British Empire

VOL. XXIV. SEPTEMBER, 1913. No. 3.

Some Observations of Blood Pressures in Cases of Normal and Abnormal Pregnancies and Labours.

By MALCOLM DONALDSON, M.B., B.C.,

Demonstrator of Midwifery, St. Bartholomew's Hospital.

THE subject of blood pressures has always been and is still one of considerable controversy. The wide range of pressures found in normal individuals diminishes its value as a diagnostic sign, but the changes of pressure in one individual are of great value in ascertaining the physiology of the cardio-vascular system under varying conditions, and to some extent are of prognostic value.

The following observations were made on cases in the Maternity Ward of St. Bartholomew's Hospital by means of Pachon's sphygmo-oscillometer. The reason for this instrument being chosen in the first instance was the fact that it gives very accurately the size of the oscillations of the artery, and by this means Pachon considered it possible to obtain the diastolic, that is, the minimum pressure. Unfortunately the method described by Pachon and used for taking the diastolic pressure in the cases described has since been found to be erroneous, and therefore not mentioned in this paper. There is, however, a distinct advantage in using this instrument for systolic pressure as it is very much easier to read than the Riva-Rocci apparatus.

There is no need to waste time in describing this instrument as there is an excellent description in the *Lancet*, vol. ii, 1911, p. 680. There is but one thing to add to that description, namely, that without a double armlet the instrument is not nearly so accurate or easy to read. The readings compared with a Riva-Rocci instrument are always higher, because the first impulse to pass through the artery as it becomes less obliterated is detected earlier by Pachon's instrument than by the digital method necessary in the Riva-Rocca instrument.

The exact difference is not a constant one except for each individual, as it depends on (1) how readily the observer is able to feel the pulse, and (2) the number and size of branches given off

by the radial and ulnar arteries, all of which tend to diminish the earliest impulses. The instrument has the disadvantage that the actual pressure is read from a spring manometer which must from time to time be standardized against a mercurial manometer, but during the period in which these observations were made it was found to be accurate.

The first series of cases to be considered are normal pregnancies and labours. There are many people who think that because a woman is pregnant and has a tumour pressing on the splanchnic area, that therefore the blood pressure must be raised. There is no evidence that the average blood pressure in pregnancy is any greater than in the non-pregnant state.

The average blood pressure taken from 25 cases of uncomplicated pregnancy was 135 mm. of Hg. corresponding to about 125 mm. Hg. Riva-Rocci, of which 14 were primiparæ who came up to the Out-Patients' Department, and these were naturally somewhat higher, as they were taken after the patient had been up for several hours; whilst the majority of those taken in hospital had been in bed for at least a day. The lowest pressure recorded in these normal cases was 105 mm. of Hg., the highest being 165. The figures given by Chappeau in a thesis on the subject are much higher, but he gives the average blood pressure of non-pregnant women as 150 to 170, and the average blood pressure of pregnant women exactly the same. Chappeau, however, used a different instrument, which accounts for higher readings.

In one case of the present series the blood pressure at the fourth month was slightly higher than it was at the seventh month, which is distinct evidence against the blood pressure being raised during pregnancy.

The hypertrophy of the heart during pregnancy about which there is, of course, considerable diversity of opinion, is often quoted as evidence of increased peripheral resistance and, therefore, increased blood pressure. Surely, a more reasonable explanation, assuming that there is hypertrophy, is to be found in the increased amount of blood that has to be circulated, about which most people agree.

The observations on blood pressure during labour are the most difficult of any to obtain. There is so little variation in these observations that it is perhaps justifiable to make some generalizations, in spite of the fact that there are but a few of them.

First stage of labour. During the first stage the systolic pressure tends to be slightly raised, and during the actual pains it rises about 15 mm. of Hg., and the pulse rate rises.

Second stage of labour. During the second stage the systolic pressure is rather higher than before, averaging 140 to 160 mm. of Hg., equal to about 125 to 145 by a Riva-Rocci apparatus. The

rise during the actual labour pains is now greater and during the expulsive spasm may rise as much as 50 mm. of Hg. It is difficult, however, to get a very accurate reading during this expulsive spasm.

Third stage of labour and after. This is the time at which it is most important to get an accurate idea of what happens to the blood pressure, as it has been suggested that the sudden collapse in cardiac cases is due to the sudden lowering of blood pressure.

With one exception, the blood pressure at the end of an hour was practically the same as during the second stage. In one case it is distinctly raised. The one exception in which there was a definite fall was a patient aged 44, and somewhat feeble. Her blood pressure in the second stage was only 125, and her pulse was irregular; the pulse-rate 100. When her blood pressure dropped to 90 half an hour later the pulse rose to 140, and was a mere flicker. During the puerperium the blood pressure declines gradually as a rule, but this might be expected of any woman who lies in bed for ten days.

The figures given by Chappeau for the pressures during labour are higher than mine for the reasons already mentioned, but he found very much the same changes, although he was not able to take a reading during the expulsive spasm.

There are very few English authors who have investigated the subject.

C. N. Longridge, in a short note, states that during pregnancy there is a slight rise of pressure, the average at six months being 120 mm. of Hg. and at seven 140 mm. of Hg.

W. Y. Vogeler, in the *American Journal of Obstetrics*, finds that normal limits of blood pressure are 100 to 150 mm. of Hg., and that there is little or no difference in pressure at the different months of pregnancy. During labour he says there is a rise in pressure which does not fall again for at least one hour.

Cook and Briggs, on the other hand, maintain that there is a slight rise of blood pressure during pregnancy.

Of German authors, Feodon Fflugbeil comes to very different conclusions, and says it gradually rises during pregnancy and falls immediately after labour, and rises gradually during the first week of the puerperium. Another German author states that there is a slight fall after the expulsion of the child lasting half a minute.

Conclusions.

It may, therefore, be concluded from the above observations, that during pregnancy there is no increase of blood pressure, nor is there any fall immediately following delivery. It was mentioned above that the latter observation was important in dealing with the various theories of the collapse in cases of pregnancies complicated by cardiac lesions. Unfortunately my observations only extend to two such cases, so that it is impossible at present to make any definite

statement about cases suffering from cardiac lesions, but it will not be unprofitable, I think, just to review briefly some of the theories and see how they fit in with the above observations of blood pressure during normal delivery.

One theory brought forward suggests that the collapse is due to a vaso-dilatation of the splanchnic area, and in consequence a big fall in pressure. In order to have a vaso-dilatation due to removal of mechanical pressure, it is necessary to imagine that the vessels have lost all tone and are *supported* by the pressure on the walls. Such a condition is very difficult to imagine. Further, this theory is upset by the absence of any fall in blood pressure. It is often said in support of this theory that there is the undoubted benefit obtained by increasing the intra-abdominal pressure by sand-bags, etc. It is possible to increase the peripheral resistance by mechanical pressure, and this is, of course, a very valuable way of assisting a failing heart.

Another suggestion is that the increased amount of blood on the venous side of the circulation is too great for the damaged heart to deal with. But, surely, if there is no vaso-dilatation, the contracted uterus should help to bank up the pressure on the arterial side.

Personally, I cannot help thinking that the peripheral circulation has very little to do with the collapse, but that over-stimulation of a damaged heart is sufficient to account for it. Possibly the work of Von Anrep on Adrenalin secretion will in the near future throw some light on this problem.

Albuminuria Cases.

The next series of cases are of considerable interest. They were taken from patients suffering from albuminuria or eclampsia. Everybody realises how difficult, in some cases impossible, it is to say whether a case should be classified as purely toxic or as partially due to an old renal lesion. Even the chemical analysis of the urine, although of value in making a differential diagnosis, cannot be said at present to be conclusive.

Is there any evidence that the blood pressure will help? My answer to this question is that during pregnancy it will not help, as in both kinds of albuminuria there is a high blood pressure, but in the cases of pure toxæmia, such as eclampsia, the blood pressure soon after labour returns to the normal and remains normal. In such cases it is possible to exclude old renal disease; but does the converse hold good, that if there is a permanent high pressure the case is partially due to an old renal lesion? If these cases can be followed through subsequent pregnancies, it may be possible to tell by the recurrence of albuminuria whether they are renal cases or not.

So far, then, we have seen that the blood pressure after labour may, to some extent, serve in diagnosing a previous renal lesion, and therefore helps in making a prognosis.

There is yet another reason for having a systematic record of the pressure, namely, in regard to treatment. There is little doubt in my own mind that the high pressure is a protective mechanism to aid in the excretion of some toxin. Moreover, in these toxic cases, there is some evidence that the cause in the increased pressure is cardiac in origin. General vaso-constriction would not be of much value in helping secretion from the kidneys, so this alone would suggest that the heart was responsible largely for the rise in blood pressure.

The first case of this series was a primiparous woman suffering from eclampsia. The main points about the case were as follows:—

A primiparæ, aged 26, in 36th week of her pregnancy. Admitted March 31. Urine contained 1·2 per cent. albumin (no mention of diacetic reaction). The first definite fit was on April 1, 12-15 a.m. At this time her systolic blood pressure was 220. Patient had three more fits before delivery, which took place at 10-30 a.m. At 2-30 patient had another fit, and at 10-17 convulsions, described as practically continuous for 35 minutes. At 12-30 a.m. on April 2 patient was infused in spite of the high blood pressure, with excellent results; she began to secrete urine, and on April 4 passed 262 ozs.

Patient came up about a year later and was found to be four months pregnant. Her blood pressure was only 120. She returned again when $7\frac{1}{2}$ months pregnant and the blood pressure was 110.

The next case was a patient, aged 36, undoubtedly suffering from chronic nephritis, probably of infective origin. Patient was admitted on June 27 and was in the 32nd week of her 7th pregnancy. The urine contained ·5 per cent. albumin, granular casts, blood casts and epithelial cells. Methæmoglobin bands were found in the spectrum. Patient had retinal hæmorrhages. On June 29 patient was delivered under anæsthetic of a dead child. Before delivery the systolic pressure was 270 mm. of Hg., and after delivery the same evening 245 mm. of Hg.

On July 1 systolic pressure was still 240 mm. of Hg. Unfortunately no further observation was made until July 12, when the systolic pressure was found to be 160 mm. of Hg.

On July 15 systolic pressure was 145 mm. of Hg., and patient was discharged. There was at this time no trace of albumin in her urine.

On June 26, a year later, patient was again examined and found to be five months pregnant (see Chart No. 3). Again she was markedly œdematous, and her systolic pressure by Pachon's instrument was 320 mm. of Hg. and 295 by Riva-Rocci. The urine contained 2 per cent. of albumin. She improved considerably, but the blood pressure did not fall below 190 and she was discharged. She returned, however, a week later, having aborted. Her blood pressure was not taken this time. On June 17, 1913, her blood

pressure was again taken and found to be 230 mm. of Hg. This is in striking contrast to the case of pure toxæmia, quoted above, which showed normal pressure in subsequent pregnancies.

The next case is one of albuminuria in which the blood pressure was, unfortunately, not taken before the third day of the puerperium, when it registered 210 mm. of Hg.; it is impossible to say, therefore, from what point is did change, but on June 8 the pressure was 145.

The next case was one of eclampsia occurring in a woman, aged 24. Patient was treated by intravenous infusion and induced. Systolic blood pressure fell to 130 mm. of Hg. five days after delivery. This, of course, is a purely toxæmic case.

Of the remaining cases of this series, one only deserves special attention:—

L. T., aged 36; admitted July 10 complaining of swelling of legs.

Past history. Scarlet fever when young; otherwise nil.

History of present condition. Legs started to swell in January.

Condition on admission. Much œdema. Urine, albumin ·27 per cent. Blood and epithelial casts present.

July 15. Labour induced.

July 17. Delivery by forceps 10-55; 11-25, adrenalin given, with marked result; 11-55, intravenous saline; 6-15, patient died.

In connection with this chart, I may say that after a great many observations on myself, other medical men and patients, I have no hesitation in condemning it as a harmful drug. Its action is happily limited by its quick destruction in the body (see Chart No. 4).

Conclusions.

Having examined the blood pressure in cases of albuminuria complicating pregnancy, it will be seen that the most striking feature is the high systolic pressure in each case. Further, it has been noticed that in purely toxic cases the pressure tends to fall quickly to normal after delivery. How far it is possible to diagnose the presence of a previous renal lesion by the fact that the pressure does not drop so low, it is, at present, difficult to say.

In the question of treatment, the observations on blood pressure do seem to be of some importance. A rising blood pressure in spite of treatment is certainly an indication for terminating the pregnancy.

Beau, in his paper, quotes a case in which blood pressure observations were made during pregnancy, and about one week previous to albumen appearing in the urine a marked rise in the blood pressure was noticed. This is further evidence that the systolic pressure is some indication of the severity of the toxæmia.

Skeel, in an article on pre-eclamptic toxæmia, confirms this observation. Vogeler finds that all his cases of eclampsia had a high blood pressure.

Observations of blood pressure were made also in a case of

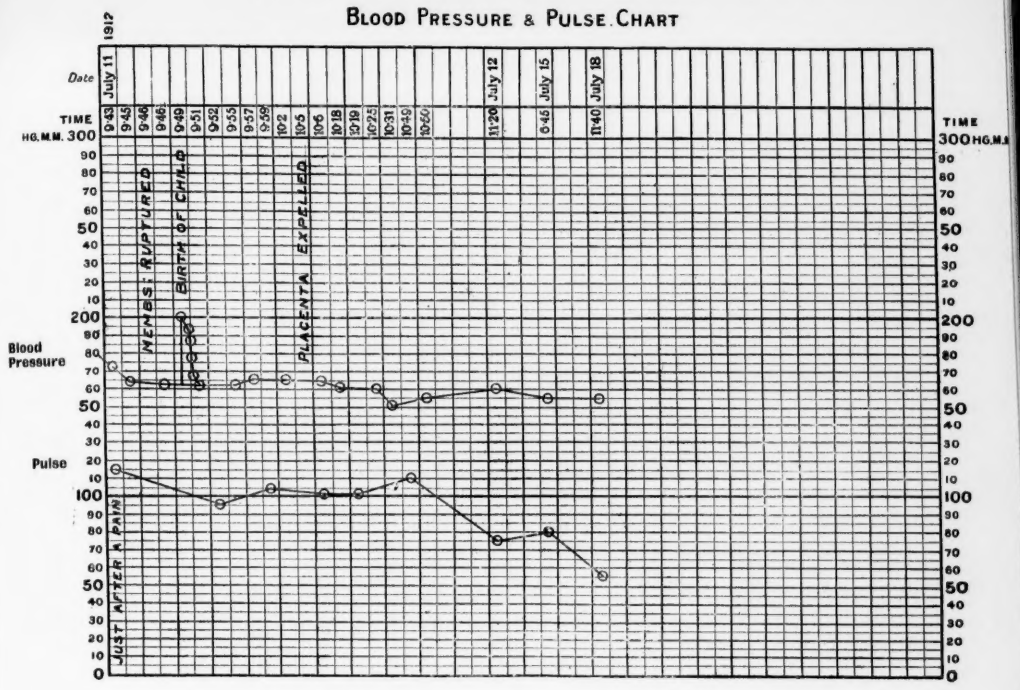
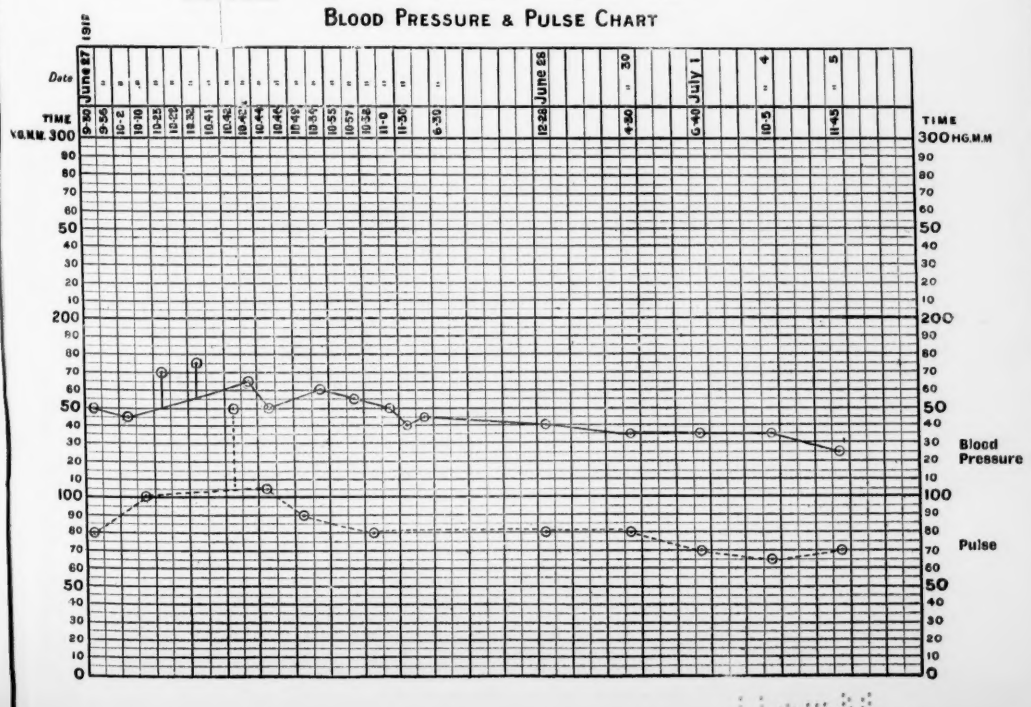


Chart I. Child was small and came rapidly after rupture of membranes. An almost continuous reading was taken during the next three minutes and the result is evidence against any sudden fall of pressure below the normal.

Chart II. NORMAL LABOUR. E.R.



Date

TIME

MM. 300
90
80
70
60
50
40
30
20
10
200
90
80
70
60
50
40
30
20
10
100
9
8
7
6
5
4
3
2
1

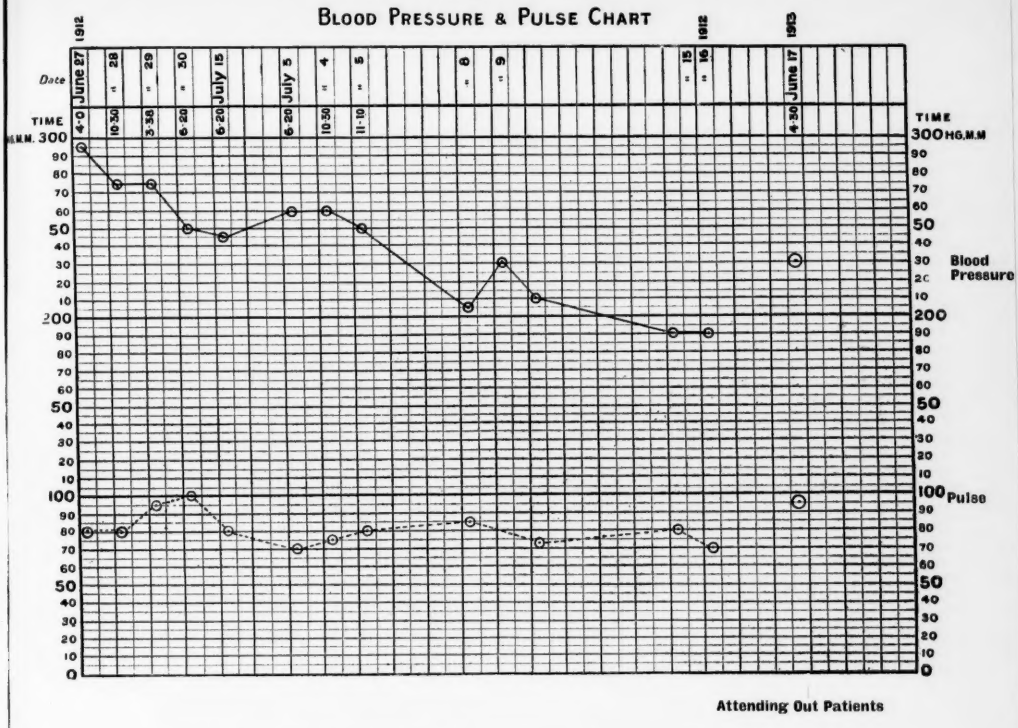
MG. M.M.

BLOOD
PRESSUR

PULS

Non

Chart III. Chronic Nephritis and Pregnancy. A. S. 33.



Case of Albuminuria (Chronic Nephritis). L.T. 36.

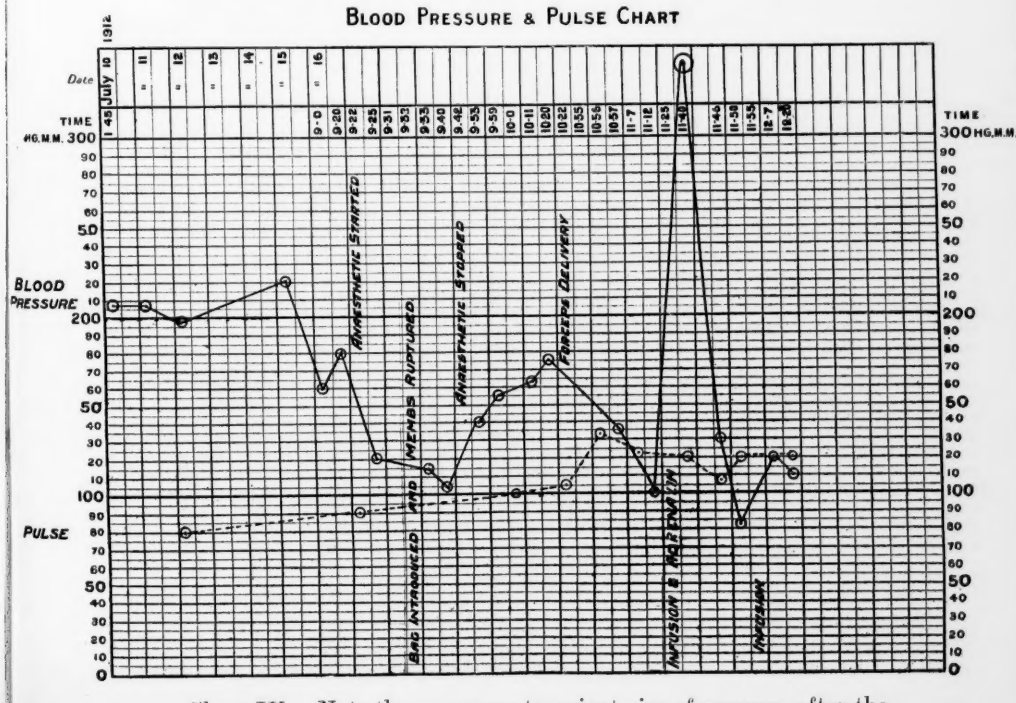


Chart IV. Note the enormous transient rise of pressure after the infusion of saline oi + adrenalin $^{1}/_{5000}$, min. xx.

UofM

pernicious vomiting in which labour had to be induced. In this condition the pressure is not raised, a fact that would suggest that the toxin in these cases differs from that of albuminuric cases.

The blood pressure estimated in a case of glycosuria complicating pregnancy showed nothing abnormal.

I am much indebted to Dr. H. Williamson for giving me the opportunity of making these observations on patients under his care.

REFERENCES.

Vogeler. *American Journal of Obstetrics*, vol. 55.
Longridge. *Journal of Obstetrics and Gynæcology*, vol. x.
Skeel. *American Journal of Obstetrics*, vol. 59.
Cook and Briggs. *Johns Hopkins Hospital Reports*, 1903, vol. xi.
Beau. Thesis, 1906.
Fcugbeil. Thesis, 1903.

DETAILS OF CASES.

BLOOD PRESSURE IN CASES OF ALBUMINURIA AND ECLAMPSIA.

The first case is of a woman, aged 25, who had eclampsia.

Past history. No history of scarlet fever or any other illness.

History of present condition. Patient was a primipara in the 36th week of her pregnancy. She had noticed swelling of legs last four weeks. No diminution in amount of urine. She was admitted into hospital March 30, 1911.

Condition on admission. Face, slightly œdematous. Abdomen, very large, due to hydramnios and twins, and was very œdematous. Legs, very œdematous. Urine, contained 1.2 per cent. albumen.

March 31st. 11 p.m., patient was very restless and slightly delirious. At 12 midnight patient had some muscular twitchings about the face. *April 1st.* 12-15 a.m. (*i.e.*, 15 minutes later) patient had a definite eclamptic fit. Her systolic blood pressure at this time was 220. Patient was taken to the theatre and the membranes of the first sac ruptured. 4-30 a.m. patient had a fit lasting two minutes. 6 a.m. patient had a fit lasting two minutes. 7-30 a.m. patient had a fit lasting two minutes, and a number of small fits, eight fits in all, before labour. At 10-15 patient was anæsthetised and the second membrane ruptured and both babies delivered. 2-30 p.m., patient seemed slightly better and partially conscious, but at 3 p.m. patient had another fit. After this patient slept until 8 p.m. At 10-7 p.m. patient had convulsions, lasting 35 minutes. *April 2nd.* 12-10 a.m., patient's condition was getting rather desperate, and in spite of the fact that the blood pressure still exceeded 200 mm. of Hg. it was decided to infuse her intravenously with saline. This was done and from that point patient

seemed to improve. The urine chart in this patient was very remarkable: On April 1st patient passed 22 ozs. of urine in 24 hours; 2nd, it was impossible to estimate the amount; 3rd, patient passed 83 ozs.; 4th, patient passed 262 ozs.; 5th, patient passed 206 ozs.; 6th, patient passed 118 ozs.; 7th, patient passed 92 ozs., and after this the amount became normal.

On April 29th patient was discharged. Her systolic blood pressure had dropped to 125; pulse 84. She had no œdema and was quite convalescent. Her urine contained only a trace of albumen.

Patient returned on March 7, 1912, to be examined as she had again become pregnant. Her urine was found to be normal, she had no œdema and her systolic blood pressure was 120; pulse 78. Patient was again seen on June 26, 1912, and after resting for an hour her systolic blood pressure was 110; pulse 80. Urine acid sp. gr. 1018. No albumen.

The next case is perhaps still more interesting. The patient was a woman aged 36.

Past history. Patient had measles when young. Has had six pregnancies. The last three ending in miscarriage at the 8th month, 5th month, 5th month. No history of œdema, etc., in previous pregnancies.

History of present condition. Patient was in her 32nd week of pregnancy when admitted.

June 24th. Patient had abdominal pain and swelling of the feet. *June 26th.* Face swollen. *June 27th.* Headache and dullness of vision.

Condition on admission. Face, puffy. Thorax, heart and lungs nil abn. discovered. Abdominal wall, slightly œdematous; fœtal heart not heard; no movements felt. Legs œdematous. Urine, 5 per cent. albumen; casts granular and blood, and epithelial cells. Methæmoglobin bands found in the spectrum. Eyes, retinal hæmorrhages were present.

June 27th. Patient was admitted and labour induced. *June 29th.* Patient was delivered under anæsthetic of a dead child. *July 15th.* Patient was discharged quite convalescent, with only a trace of albumen in the urine.

Blood pressure. On *June 29th* the systolic pressure was 270 mm. of Hg. and after delivery the same evening was still 245. *July 1st.* Systolic pressure was still 240. Unfortunately no further readings were taken until *July 12th*, when the pressure was found to be 160. *July 15th.* Systolic pressure was 145.

This patient was again seen on June 26, and she was then five months' pregnant. She said that she had had œdema of feet for last three months.

On examination it was found that her face and legs were markedly œdematous. Her blood pressure was very high indeed. Systolic by the visual method being 320 and by feeling the pulse 295.

These readings were repeatedly taken, and although there was considerable variation as much as 10 mm., even more than this with the visual method, none of the readings were less than 290.

A specimen of her urine was examined and the sp. gr. was 1025. The amount of albumen was 2 per cent.

The next case is that of a woman aged 26.

Past history. No previous illness.

History of present condition. Patient was a primipara in the 33rd week of pregnancy. Three weeks ago the patient's legs began to swell. One

week ago patient's face, eyes, and vulva began to swell. Ocular symptoms started on December 20. Abdominal pain on December 25.

Condition on admission. Head, marked œdema. Eyes, some œdema of optic discs. Urine, albumen 1.05 per cent; no casts. On December 28th, patient passed 5 ozs. urine; 29th, patient passed 29 ozs.; 30th, patient passed 45 ozs.; 31st, patient passed 23 ozs; January 1st, patient passed 72 ozs.; January 2nd, patient passed 50 ozs.

December 28th. Patient was delivered and placenta removed under anæsthetic. *January 1st.* Œdema much less, albumen=0.78 per cent. *January 10th.* Patient discharged to a convalescent home. Urine contains 0.06 per cent. albumen. Three weeks later patient had a faint trace of albumen in her urine, less than 0.01 per cent.

Blood pressure. Unfortunately the blood pressure in this case was not taken until January 1, 1912, *i.e.*, two days after delivery. The systolic pressure was still 210. On January 8 the systolic blood pressure had dropped to 145.

A.D., aged 24, was admitted to hospital on April 27.

Past history. Scarlet fever at 14. No previous pregnancy. No history of nephritis.

History of present condition. Patient was quite well until April 27 when she had a fit, some vomiting and epigastric pain.

Condition on admission. Much œdema of face. Fundus of eye nil abn. Abdominal wall, œdematous. Legs, œdematous. Urine, showed 0.2 per cent. of albumen; large quantity of granular casts.

Labour was induced the same day, and patient was infused with sodium acetate in normal saline oil.

April 29th. Another fit in the morning. Patient delivered at mid-day of dead fœtus. Some post partum hæmorrhage. Patient infused with saline. *May 14th.* Left hospital convalescent. Urine contained 0.025 per cent of albumen. Systolic blood pressure 130.

The next case is that of a woman aged 32.

Past history. Nil abnormal in previous pregnancies. No previous illness of importance.

History of present condition. Patient in about the 36th week of pregnancy. Has not felt well during the present pregnancy. Morning vomiting has never ceased and patient had persistent frontal headache. Some ocular symptoms.

Condition on admission. Face, somewhat œdematous. Eyes, nil abnormal. Abdomen, slight œdema. Legs, œdematous. Urine, 0.1 per cent. of albumen.

February 27th. Patient delivered of a dead fœtus, death being due to intra-uterine rupture of an umbilical artery.

Blood pressure. The blood pressure was taken three times in the first day and in the evening was found to have fallen to 175. Two days after delivery the blood pressure began to drop. March 7th, patients systolic pressure was 140.

The next case is that of a primipara, aged 20. It is not a severe case, but shows the same points to some extent. Admitted to hospital, August 29th.

Past history. Is very indefinite.

History of present condition. For the last few days patient has had

headache and some vomiting, and she has noticed a definite diminution in the quantity of urine passed.

Condition on admission. Œdema of legs, face, and vulva. Urine contains 0.74 per cent. of albumen. A few casts. A few pus cells. No blood.

Blood pressure. The systolic pressure before delivery was 175, after delivery 150, and on September 8 it had dropped to 125.

L.T., aged 36, admitted July 10.

Past history. Scarlet fever when young. Rheumatism 8½ years ago. Six previous pregnancies. Œdema present during each pregnancy. Had fits following labour 12 years ago. Nine years ago in Martha Ward for œdema complicating pregnancy.

History of present condition. Both legs started to swell in January. Since October has had much vomiting until fourteen days ago. Patient noticed earache in March followed by paralysis of right side of face, which has since improved.

Condition on admission. Patient looks anæmic. Some paralysis of right side of face. Legs very œdematous below knees. Urine, 0.275 per cent. of albumen. Blood and epithelial casts present.

July 15th. Labour induced. *July 17th.* Child delivered by forceps. Placenta partially adherent, expressed at 11. 11-30, slight hæmorrhage from uterus. Patient very collapsed, infused intravenously. 12-0, uterus plugged. 1-0, still bleeding in spite of ergotine, etc. 6-15, patient died.

Results of the Radical Operation for Carcinoma of the Cervix Uteri based on a Three Years' Basis, more especially with regard to its Life-prolonging Effects.

By

Comyns Berkeley, M.C., M.D. (Cantab.).,
Obstetrical and Gynæcological Surgeon, Middlesex Hospital;

and

Victor Bonney, M.S., M.D. (Lond.),
Assistant Obstetrical and Gynæcological Surgeon, Middlesex Hospital.

The radical abdominal operation for carcinoma of the cervix has been practised in Great Britain for such a comparatively short time that no individual has performed a sufficient number of operations prior to July 1908 to render the statistics on a five years' basis of any value as compared with those of Continental surgeons.

It is agreed that a five years' freedom from recurrence may be regarded as a cure. There is, however, another aspect of cases of operation for carcinoma of the cervix, namely, prolongation of life. The statistics of Archibald Leitch based on a study of over 900 cases dying of carcinoma of the cervix in the Middlesex Hospital Cancer Charity Wards show that the life expectation of these patients from the earliest symptoms to death is one year and nine months. We therefore think it worth while to lay before this meeting the results of 71 operations performed by us up to June 1910.

The technique we have employed follows in the main that of Wertheim, but we have systematically in all the cases removed the glands in the parametric tissue, the obturator fossa and along the iliac vessels, whether they have been enlarged or not. We have therefore divided the operation into two stages—the first of which terminates with the removal of the uterus, the attached vagina and the adjacent parametric and paravaginal tissue. The second stage commences by stripping off the cellular tissue sheath and its contained glands which cover the iliac vessels. This separation is begun at the bifurcation of the common iliac artery if the glands lying on the external iliac are not enlarged and just below the aorta if they are enlarged. We endeavour to separate this piece of tissue from the vessels in a single sheet, although, as Wertheim has pointed out, it is often too fragile to effect this. This sheet is on its inner

side continuous with the tissue lining the obturator fossa, and in favourable cases may be reflected inwards and still attached to it. The fingers are then inserted between the bony pelvic side wall and the hypogastric artery, and keeping close to the bone separate from it the large mass of cellulo-fatty tissue which occupies the obturator fossa. In this manœuvre the obturator nerve is included in the mass and requires separation from it; otherwise it would be removed. The obturator vessels which cling close to the bone are not interfered with.

The sheet of tissue having been separated laterally is freed from the pelvic floor below by means of the finger, so that it only remains attached by its two ends. The lower or vesical end is now clamped and divided above the clamp when it will be found that the whole mass can be reflected upwards pivoted on the anterior trunk of the internal iliac artery and a stout ligature having been placed on this pedicle the mass is cut away. This ligature replaces that previously placed on the uterine artery, which is removed with the mass of tissue. The net result therefore of the operation is to clear away down to the bone the cellular tissue lateral to the uterus and upper vagina.

We appreciate that this second stage of the operation adds considerably to its severity, both as regards immediate shock and the complications of convalescence, but we have deliberately practised it in the hope that our late results will be improved thereby. Further, it has enabled us to deal with those advanced cases which to an operator who limits himself to the simple extirpation of the primary growth would be inoperable.

Our 71 operations were chosen from 112 patients with carcinoma of the cervix presenting themselves for treatment over the period April 1907 to June 1910—an operability rate of 63 per cent. These 112 cases represent every patient that came under our observation either in the in or out patient departments of the hospitals to which we were attached or in our private practice. This operability rate of 63 per cent. is not as high as it would have been if we had, like Wertheim, excluded those cases who refused to submit to operation, though advised to do so. It represents, we believe, the limit of what can be performed on cases of the type that come under our observation, for we have only refused or desisted from the operation when the growth has gravely involved the bladder, both ureters or the rectum.

In estimating an operability rate it is absolutely necessary that it should include every case attending the in and out patient departments, that is, that the patients should not have undergone any previous selection.

The best control of the *value* of an operability rate and the surest indication of the advancement of the cases dealt with is the per-

centage in which the glands were found carcinomatous at the operation. For it has been shown by Leitch and McCormac that in persons dying of the disease unoperated upon, 46 per cent. exhibit secondary growths in the regional glands. It therefore follows that the larger the number of patients operated upon out of those seeking relief the greater will be the percentage of carcinomatous involvement of the glands. Thus whereas Wertheim, with an operability rate of 43 per cent. in his first 250 cases, reports glandular involvement in 20 per cent., we, with an operability rate of 63 per cent., have found glandular metastasis on microscopical examination in 33·8 per cent.

Our results may be briefly stated as follows:—

Cases presenting themselves for treatment	112
Cases operated upon	71
Died of the operation	16
Died of recurrence	20
Died of intercurrent disease	2
Disappeared cases	2
Alive, but with recurrence	3
Alive and well	28

Operative mortality. This works out at 22·5 per cent. Ten cases died of shock, two cases died of paretic ileus, one case of mechanical ileus, one case of pelvic suppuration and empyema, one of post operative hæmorrhage and one of broncho-pneumonia. The deaths by shock comprise those who succumbed a few hours after the operation apparently as the result of its severity and in whom no signs indicative of any other cause of death could be found either clinically or on autopsy. In the cases in which the glands proved to be carcinomatous at the operation the mortality was 29·5 per cent. In those in whom they were not carcinomatous it was 19 per cent.

Recurrent disease. In 23 cases the disease recurred. Three of these patients are still alive at periods of four years or over from the operation. In only one place did the recurrence take place in the vaginal scar. In the rest the growth has appeared either in the upper part of the pelvis or in the situation of the aortic glands. The recurrence rate therefore, if reckoned on the 71 cases operated on, works out at 32·4 per cent. If reckoned on those surviving the operation (55) it works out at 41·8 per cent. These figures of course rest on a three years' basis; but, accepting Wertheim's experience that 8·9 per cent. of the total number of recurrences occur in the 3rd and 4th year then it is possible to forecast that in 1915 the disease will probably have recurred in 29 cases; that is to say, a recurrence rate of 40·8 per cent. if reckoned on the number operated on and 52·7 per cent. if reckoned on the number surviving the operation.

Late results. Wertheim's method of calculating the late results

excludes all cases dying of the operation as well as those dead of intercurrent diseases and those which have disappeared and cannot be traced. This he calls the *ideal* late result. Zangemeister, on the other hand, includes those dying of the operation, and by this method is obtained the *actual* late result. Our *ideal late result* is 54·9 per cent., and our *actual late result* is 40·5 per cent., 28 out of the 71 cases showing no recurrence.

Actual accomplishment. The actual accomplishment may be calculated according to Wertheim's formula, Winter's first formula, Waldstein's formula or Winter's second formula.

Wertheim's formula. Having deducted from the total number of cases seen those patients who died of recurrent disease, this leaves us 110 cases with 28 free of recurrence, an actual accomplishment of 25·4 per cent. Wertheim also deducts those patients who refused operation. As we have no complete record of these we have included them, and in this respect our statistics are not so favourable.

Winter's first formula. This is calculated by multiplying the operability rate, 63 per cent., with the ideal late result, 54·9 per cent., and dividing the result by 100, making an actual accomplishment of 34·5 per cent.

Waldstein's formula. This is calculated by multiplying together the operability rate, 63 per cent., the ideal late result, 54·9 per cent., and the difference between the percentage of operative mortality, 22·5 per cent., and 100, *i.e.*, 77·5, and then dividing the result by 10,000, giving an accomplishment of 26·8 per cent.

Winter's second formula. This is calculated by deducting from the total number of cases, 112—

(1) The number refusing operation (not estimated).
(2) The disappeared cases (2).
(3) The intercurrent deaths (3)=108.

From these deducting—

(1) The number dying from operation (16).
(2) The number of recurrences (23).
(3) The number unoperated upon (41)=28.

On multiplying 28 by 100 and dividing the result by 108 an actual accomplishment is obtained of 25·9 per cent.

The three years' basis on which these results are calculated does not enable us to claim a large number of cures, yet it seems to substantiate the life prolonging effects of the operation on those who survive it.

The Intra-abdominal Pressure in Pregnancy.

By R. H. Paramore, M.D., F.R.C.S.,

Formerly Hunterian Professor to the Royal College of Surgeons of England; and Pathologist and Registrar to the Hospital for Women, Soho Square, W.

(Continued from page 90).

But besides the indisputable evidence that increase in volume of the viscera may occur without increase of pressure within the abdomen, there is also clear evidence that a rise of pressure occurs when the distension exceeds certain limits. Moritz says, although the abdominal wall be very yielding, it is impossible to think that a rapid distension of the intestines as by gas should occur without a rise of intra-abdominal pressure due to the abdominal wall. But, as we have seen, he will not admit such occurs in pregnancy; or, if it does, only to a small, inappreciable and unimportant extent. He gives, however, the pressures found in a case of ascites due to cirrhosis of the liver. The intra-gastric pressure, the patient lying on the back, was 22 cm. water; and the intra-abdominal, determined by puncture of the abdomen at its summit, showed the same value. After removal of 15 litres of exudate, the pressure in the stomach was now only 4 cm. water. He says, the extent of the intra-abdominal pressure in this case compared with the normal showed a very considerable increase; yet, he adds, with such an addition to the contents of the abdomen, one was prepared to expect even higher figures. Since the pressure measured within the peritoneal sac was that which existed at its highest point, it must have been due to a tension of the abdominal walls; the weight of the fluid can have had nothing to do with the pressure obtaining. The possibility of such tension of the abdominal walls must then be admitted.

And Kelling (1895) says that although the abdominal wall gives way when the volume of the abdominal cavity is increased so that one can comfortably take two litres of water into the stomach and rectum, such yielding has a limit. Abnormal collections of air, liquid and the presence of large tumours, he says, cause a tension of the abdominal wall, which may reach, according to Quincke in a case of ascites, a pressure of 26 to 58 cm. water. Thus a pressure is produced by " overfilling " the abdominal cavity by a resistance of the abdominal walls.

Direct evidence of this appears in a later paper by Kelling (1903) on the tension of the abdominal wall,[13] in which he shows the effect

of distending the peritoneal sac with air and filling the stomach with food on the pressure within the abdomen. He experimented on dogs, which he caused to fast for 24 hours. When the time for experiment had come they were bound to a table in the dorsal decubitus, but were not anæsthetized. A trocar was thrust into the abdomen over the liver dulness, and the abdominal cavity blown out with successive additions of air, the pressure with each increment of air pumped in being recorded. The air was then released in stages, the pressures again being observed. This experiment was repeated two or three times on the animal. The dog was then loosened and allowed to eat. It was then bound to the table, as before, and air pumped into the peritoneal sac, the successive pressures resulting on each increase in volume being recorded. Finally, the dog was killed, and the volume of the entire viscera measured, and then that of the contents of the stomach. By subtraction, the volume of the fasting viscera was estimated.

Kelling found that the pressure rose in proportion with the distension of the abdomen with air, and that when the distension exceeded a certain limit, which was reached when the volume of the abdominal contents had been about doubled, the pressure rose fairly suddenly, the curve taking the form of a hyperbole. Whilst he was unable to demonstrate that a reflex relaxation of the abdominal wall occurred when the abdomen (peritoneal sac) was being distended with air, all his pressure records showing a gradual rise, he found an undoubted yielding of the tension of the abdominal wall was produced by filling the stomach with food, so that the pressure remained the same, or about the same. This, he says, he was able to prove in his experiments which were free from error (Kelling's statement), by injecting a small quantity of air into the abdominal cavity and estimating its pressure subsequent to the meal. It was found that, in spite of the considerable increase in visceral contents due to the meal, the pressure was always the same, or approximately the same, as the atmospheric pressure. This is the pressure, he says, which exists in the abdominal cavity in the fasting condition.

Two points are clear, however, from Kelling's paper: (1) that the pressure obtained by blowing out the abdominal cavity (peritoneal sac) after the dog had eaten were always higher than those obtained when the dog was fasting—the same amount of air being pumped in in each case; and (2) that the pressures obtained in fat dogs were greater than those found in thin ones—the amount of air blown in being the same. Moreover, in dogs which are fat, *i.e.*, in which there was a considerable deposit of fat amidst the viscera, and the contents of the abdomen were therefore relatively large in spite of the 24 hours' fast, the rise of pressure produced by inflation commenced at once. But in dogs which were thin a good deal of air had to be pumped into the peritoneal sac before any pressure at all was

observed; whilst after the thin dogs had fed a lesser quantity of air was required to cause the same pressure as before.

These differences, it seems to me, are explained by the course of the recti abdominis muscles, and by the effect of their action upon the pressure within the abdomen which depends upon their disposition. In fat animals (dogs) the recti run a more or less straight course from the pubes to the sternum, or are even bulged outwards, and this is still further exaggerated by still further distending the abdomen. In this state their tonic contraction will clearly add to the pressure within, for by tending to straighten they will compress the viscera. But in thin animals the recti are highly arched, *i.e.*, sunken inwards towards the spine; and in this state their tonic (continuous) contraction will diminish the pressure within the abdomen and maintain it low, for they tend to straighten and thus to enlarge the abdominal cavity. It is easy to see that a positive pressure will only be produced within the epigastrium when the recti become bulged outwards by the distension of the abdomen.

Kelling's results demonstrate that the volume of the visceral mass, quite apart from the weight, plays a very important part in the pressure within the abdomen. This, after all, is easily intelligible; theoretical reasons alone would lead us to suppose it occurred. Even although it be admitted that a relaxation of the abdominal wall (and thoracic diaphragm) occurs when food is taken into the stomach, it is not to be supposed that the relaxation is complete, that the tonic contraction of the enclosing musculatures has disappeared. And even though a fall in pressure occurs immediately after taking moderate quantities of food, it cannot be supposed the fall long persists; but that the pressure gradually and soon rises to its ordinary level. The feeling of emptiness, immediately after a small meal, which often surprises one, and which is perhaps due to an accompanying relaxation of the belly wall muscles, does not last long; it is replaced by a feeling of satisfaction or sufficiency, due, so it seems to me, to the passing away of this partial relaxation. Nor can it be thought this relaxation would go on, that the tonic contraction would become lesser and less—*ad infinitum*—if the visceral mass should progressively increase. For, if so, and if the enlargement of the abdomen became permanent, as in corpulent people, one would expect the abdominal wall to have become weaker and weaker, instead of stronger and stronger as we know it does. That it is stronger in such individuals (other things being equal) clinical examination shows. Presumably this relaxation has a limit. At least in the case of the stomach, a stage is soon reached in which definite sensations of fulness or of distension are produced, which clearly are not altogether due to distension of the stomach itself, since they are relieved by loosening the clothes, *e.g.*, by undoing a button, or by altering the posture. We know that slight changes in posture affect

the pressure in the stomach; and that if the pressure in the stomach tends to rise, such change may prevent the pressure rising. In the case of pregnancy the relaxation of the abdominal wall (and the thoracic diaphragm) probably associated with the enlarging uterus also has a limit. That limit is reached when the uterus, entering the abdomen, begins to bulge the abdominal wall. From this time onwards the pressure, not only in the pelvis but in the abdomen above the uterus, begins to rise, and, although in the latter months of pregnancy it may begin to fall, it is maintained increased in many cases throughout that period.

III. *Reasons for believing the intra-abdominal pressure is increased in pregnancy. The reactions of the body wall muscles and thoracic diaphragm in pregnancy, and the causes of the same.*

So far we have seen the pressures in the rectum found in pregnant women indicate that the pressure in the abdomen—and above the uterus—is increased in pregnancy. The view that these pressures are due to the mere weight of the enlarged uterus has been shown to be untenable, for the arguments on which this view is based are invalid. The remarkable pressure found in the rectum in the lateral position, the patient lying at ease, is clearly irreconcilable when the hypothesis that the rectal pressure is due in this position to the uterine weight. It shows the viscera are thrust into the pelvis with a force greater than in the non-pregnant in the same position, and is only to be explained by supposing that the tonic contraction of the abdominal wall and thoracic diaphragm is increased. The figures given by Moritz for the stomach pressure in pregnancy indicate this is certainly so—at least in some cases. And if the figures from all his cases are not sufficiently high to at once substantiate our opinion that an increase in tone in pregnancy is the rule, they do not render that opinion untenable—as we shall see.

Many observations might be brought forward in support of this conception; for instance, the relation of pregnancy to heart disease, its influence in pneumonia, its remarkable effect on many multigravidæ, who say they never feel so well, and certainly who never look better, than when they are pregnant. These well recognized relations are only to be explained by supposing the intra-abdominal pressure is increased in pregnancy. But interesting and important as they are, they must be left aside now; for the proof that the intra-abdominal pressure is increased in pregnancy does not rest with them, but with the condition in pregnancy of the muscular sheets enclosing the abdomino-pelvic viscera. For, if in the non-pregnant, the intra-abdominal pressure is due mainly to the functioning of these musculatures, and if the visceral weight, though subsidiary, is yet an unimportant factor; then, in pregnancy, if the intra-abdominal pressure is persistently increased, and is due to the

increased functioning of these musculatures and not merely to the increased visceral weight, these musculatures should show some structural change—and so they do!

Reference has already been made to the hypertrophy of the pelvic floor musculature. This is readily revealed by comparing its thickness by bi-digital palpation* in women with flat abdomen and in those who are pregnant; and moreover an increase in tone is also present. The anterior parts of the levator ani muscles—those which form the lateral and posterior boundaries of the aperture in the pelvic floor through which the urethra, vagina and rectum pass to quit the pelvis [20] are easily felt to be greatly strengthened by a considerable increase in mass in pregnancy. In virtue of their functioning, not only are these visceral canals occluded by being compressed against the pubic arch in front; but the aperture in the pelvic floor through which they pass—conceived by so many to be a patent foramen—is itself occluded, and thus visceral extrusion—more likely in pregnancy, because of the increased pressure within—is prevented. Thus is their hypertrophy easily intelligible. And of equally important significance is the remarkable development of that part of the pelvic floor musculature arising from the ischial spine—the posterior part of the ilio-coccygeus and adjacent part of the coccygeus; the part, indeed, which so thin in non-pregnant women has been denied any functional value. This can now be felt, especially in primigravidæ, as a thick fleshy mass, possessing considerable tone, painful on squeezing between the vaginal finger above it and the thumb on the skin below it, and hardening on coughing, indicating its nature. It can be traced from its origin, the ischial spine, inwards to its insertion the coccyx and ano-coccygeal ligament. With its fellow of the opposite side and the osseo-fibrous raphe between, it forms a strong and broad sling passing in a gentle curve from side to side of the pelvic outlet. Situated far behind the line through which gravity acting on the enlarged visceral mass in the pregnant woman must fall, its curvature is placed on a plane which passes obliquely upwards and forwards through the transverse diameter of the brim, approximately at right angles to the brim. Clearly, it is especially adapted to resist efficiently the pressure impulses with which the whole uterus, enlarged by pregnancy, is thrust downwards and backwards towards it from the abdominal wall, as occurs with every movement, every respiration of the woman.

It may be supposed this hypertrophy is due to the progressively increasing weight of the uterus, which at term is considerable. But we find the muscular development corresponds, not with such

* With two fingers within the vagina upon the upper surface of the musculature and the thumb on the skin of the ischio—rectal fossa—by approximating the opposing digits, the muscle is felt between and can be felt to harden when the patient coughs.

increase of visceral weight, but with increase of visceral pressure. Thus the hypertrophy is best marked in young, strong, robust primigravidæ—in individuals, that is, in whom the whole body musculature is well-developed. It is not so well developed in primigravidæ who are not physically strong; nor is it so conspicuous in multigravidæ, although the child is often larger and the pregnant uterus therefore heavier. And it is just in the strong and well-developed primigravidæ that the highest pressure values are found, as a comparison of Cases of 1 and 4 of my list shows.

In the case of the abdomen, a recognition of the state of its enclosing musculatures—the abdominal wall and thoracic diaphragm—is more difficult; for one cannot palpate them in the same way as in the case of the pelvic floor musculature; one cannot arrive at a very definite opinion as to their thickness; and in the case of the diaphragm, palpation of any kind is impossible. But a consideration of their condition in pregnancy, and a correct interpretation of this condition, are highly important. It is clear from inspection of the pregnant abdomen, especially near term, that a very great change has occurred in the abdominal wall. Two phenomena stand out for consideration: (1) the increase in superficies; and (2) the separation of the recti.

The increase in superficies of the abdominal wall affects all its muscles; the increase occurs not only in the transverse circumference, but measurements easily show the vertical arc has increased, that the recti have become longer. The difference in girth of the abdomen at the level of the umbilicus in late pregnancy, and, say, three weeks after confinement, appears from my figures to be about 7 or 8 ins.; but much depends on the condition of the abdomen at the time of the second reading. The greatest difference in my series occurred in the second case of the toxæmia of pregnancy; the difference in girth two days before and eight days after labour was 11 ins. But it may, of course, be much more. In cases of twin pregnancy for instance, the abdomen may measure more than 40 ins.; in one of my private cases it reached 45½ ins. Subsequent to labour a very considerable diminution had occurred. From the few cases in which I measured the length of the recti muscles before and after labour, it is clear they may increase as much as a third of their original length during pregnancy (*see* Case 9), although often it is much less than this.

Whether the recti abdominis muscles are hypertrophied or not, they are certainly very well developed in pregnant women; and the suggestion is they are hypertrophied. Indeed, there is very good reason to suppose this is so. It is difficult to believe their increase in length is due to passive relaxation; for that would mean their functional capacity was reduced; whereas, owing to the marked

increase in weight of the body, and the advance of the centre of gravity due to the protrusion of the abdomen, a greater work for the recti becomes necessary for the maintenance of equilibrium. Schatz found that the pressure in the rectum in the erect posture was increased when the individual inclined backwards, but fell on bending forwards. The increased pressure in the former position can, I think, only be explained by an increased action of the recti. One has but to stand upright and palpate the recti muscles (even through the clothes) to feel that they distinctly increase in hardness when one inclines backwards. Similar palpation of the abdominal wall outside the recti shows no such increase. And, as is well known, the carriage in late pregnancy is altered in this way.

The recti, of course are mainly concerned with the body equilibrium; but they cannot but affect the pressures in the abdomen when this is full; and especially must they do so in pregnancy, when the visceral mass is greatly enlarged by the enormous growth of the uterus. Clearly, they will do this most in extended positions, when they are stretched, as when the individual is standing erect or lying supine. But in flexed positions of the body, as in the lateral or when bending forwards, they will have less effect; because their origins and insertions are nearer each other, and a passive shortening of the muscles occurs. The abdomen bulges, it is true; but this, whilst it causes a lengthening of the transverse muscles of the abdominal wall, causes the vertical to become less. The strange and unexpected increase in the rectal and gastric pressures, found in the supine compared with the lateral position (in the case of the stomach, with the right lateral) seems to me only explainable by the effect the supine position has in increasing the tension (*i.e.*, the tone) of the recti. This occurs in the non-pregnant as in the pregnant; but the relative increase is, in most cases, much greater in pregnancy.

We are here on the brink of a most important discovery: that the active elongation of a muscle, due to its being stretched, is associated with or causes an increase in tension or tone (an increase in tonic contraction) of that muscle. The increase in tone of the recti in the supine position compared with that in the lateral, indicated by increase in pressure, can only be accounted for by the increase in length of the recti the supine position causes. For there is no physiological reason why the pressure should be greater in the supine over and above that in the lateral position; such, for instance, as there is when the erect posture is assumed.* And examination of the limb muscles confirms this opinion. The tone of the biceps of the arm (as shown by palpation of its tendon) is greater when the arm is in a position of passive extension, than when in one of passive

* Necessity for increased supply of blood to the heart, so that an adequate blood supply to the brain may be maintained in spite of the effect of gravity.

flexion. The same is found in the case of the hamstrings. A good example is the pectoralis major. When the muscle is palpated in the supine position, the body and limb being supported completely from below (so as to eliminate the effect of gravity), the tone or tension of the muscle is felt to be distinctly and very much greater when the arm is in a position of passive abduction (in which case, of course, it is actively elongated and its fibres stretched), than when in a position of passive adduction (when its muscle fibres are very much shorter). Obviously, this—for us—is of profound importance.

With the knowledge that the recti are considerably elongated (stretched) in pregnancy, that there is above this a need for their greater functioning, and that considerable variations in their length passively occur—with change of posture—and especially that during the long hours of the night, generally spent in the lateral position, their length and so their tone is diminished—conditions which are the essentials for hypertrophy—we cannot but suppose their hypertrophy occurs. Indeed, that the recti are not hypertrophied in pregnancy is unthinkable.

The other muscles of the abdominal wall—which after all are those mainly concerned with the pressure conditions within the abdomen as their phylogeny shows—are the two obliques and the transversales; but, for the sake of simplicity, we will omit the obliques and confine ourselves to the transversales. These, which extend throughout the abdominal wall, from the pubes to the ensiform cartilage, always act together; and the tension caused by their contraction becomes effective since they are united anteriorly by the median aponeurosis, a strong fibrous membrane situated behind the recti, and forming part of the sheaths of those muscles. The two transversales and the median aponeurosis collectively form a compressing mechanism, embracing the visceral mass; for they consist of transverse fibres, and can have no other effect than to compress the visceral mass and to cause a pressure within the abdomen—they cannot, for instance, have any direct effect on the maintenance of body equilibrium, like the recti have.

What is the condition of the transversales in pregnancy? Obviously, they are not in the same condition as before. Their muscle fibres have become at least longer; for the width of the diastasis between the recti does not account for the difference in girth between the pregnant and non-pregnant abdomen. My measurements show that at once. But to understand their condition we must enquire into the nature and cause of the separation of the recti—the second phenomenon we mentioned, spoken of as a physiological separation, and so dismissed by writers. This separation occurs, as everybody very well knows, in the great majority of pregnant women who reach term. It is only found to any marked extent in the latter months of pregnancy; and in some cases it is

much less than in others.* And, it is more or less peculiar to pregnancy, or is associated with pregnancy; if present in a non-pregnant woman, that woman has previously been pregnant. Eccles[6] says: "Rarely an abdominal tumour may produce a like separation in the male sex." If so, it may similarly be produced in nulliparous women by tumours; but if it occur in such cases, the separation must be so small that it is not comparable with the condition in pregnancy. But I am very sceptical of these reputed cases; the only other condition besides pregnancy in which I know it to occur is in early infant life.

Subsequent to pregnancy the separation of the recti usually disappears; and even though the contents of the abdomen may later become so much increased that the circumference of the abdomen exceeds the average girth of the pregnant abdomen at term, it does not necessarily recur. In a woman I examined past middle age, in robust health, and who had had several children, the circumference of the abdomen was 40 ins.—in excess of the average girth in late pregnancy—yet no separation of the recti was present. She was a very vigorous and corpulent person. I venture to say that this is the normal condition in all healthy corpulent people. Separation of the recti does not occur as a result of corpulency—that is, of an increase in volume of the visceral mass, equal to or even greater than that occurring in pregnancy.†

* The greatest separation I have seen was in the case of twins already referred to: here it measured $5\frac{1}{2}$ inches. But in my list, the largest was 3 inches.

† Exception was taken to this statement when the paper was discussed at the Royal Society of Medicine. It was suggested the increase in girth was due largely to the subcutaneous fat deposit. It is so obvious that the subcutaneous tissue is increased in thickness in corpulency that I have not mentioned it in the text—after all, one expects readers to have some knowledge and to allow credit for some honesty in oneself. And I should have thought operating gynæcologists would be sufficiently acquainted with the fat deposit in the renal regions, mesenteries, subperitoneal tissues and omentum (which itself in obese people is often very thick) to have admitted the volume of the visceral mass is very considerably increased by it. But if readers want actual proof, I refer them to the paper by Prof. Symington on "The Abdomino-Pelvic Cavity"[25]. On page 153 of this paper are two drawings of this cavity, one superimposed on the other, one taken from a section of a fat corpse, the other from a thin one. But I have said in the text that the volume of the visceral mass in corpulency may be equal to or even greater than that due to pregnancy; and I do not think that an exaggeration when the condition of corpulency is well marked. For in very fat people the enlargement is very great even when allowance is made for the subcutaneous fat; and we must remember the fat is distributed all throughout the visceral mass, whilst in pregnancy the fat, at least in the pelvis, disappears (Veit).[26] But even if my statement is an exaggeration, even if the volume of the visceral mass in corpulency does not become greater than, or equal to, the volume of the visceral mass in pregnancy, it will be admitted it is increased considerably in the transition from the slim to the corpulent state. To admit so much is sufficient for the argument.

This, at first sight, extraordinary difference in the effect produced by enlargement of the visceral mass in pregnancy and corpulency is, I believe, to be explained quite simply—by the time taken by the increase to occur in each case: difference in content (fat and pregnant uterus) cannot be supposed to explain it. For whilst the deposit of fat—in the mesenteries, renal regions and subperitoneal tissues—is a slow process, taking, perhaps, one or two years to occur; in pregnancy, the increase in volume of the visceral mass caused by the growth of the uterus is much more rapid—the great increase (beginning, say, at the end of the third month) occurring in about six months only or even less. So also, the relatively slow growth of tumours, such as fibroids and ovarian cysts, explains the usual non-separation of the recti—the muscles of the abdominal wall have time to adapt themselves to the increase; whilst, on the other hand, the rapid enlargement of the abdominal viscera in infants, caused by the taking of food (milk) and the increase in mass, and so in volume of the visceral tissues themselves associated with digestion, etc., coupled with the sudden descent of the diaphragm becoming more and more permanent (due to respiration), seems to explain the separation, such as it is, seen in them.

Since in corpulency, as in the non-pregnant with flat abdomen, non-separation of the recti is the normal condition, the separation in pregnancy, though usual in that state, is not normal; it is pathological, not physiological.* Clearly, the recti themselves can have had nothing to do with it, for when their contraction is increased, as when a woman lying supine raises her head, they tend to come together and to reduce the diastasis. The separation is due to a stretching of the linea alba, the median part of the aponeurosis uniting the flank muscles. Obviously the separation is associated with the pull of the flank muscles; it is associated with the bursting effect caused by the enlargement of the visceral mass; it is evidence the flank muscles resist the distension.

Now, in corpulent people who are robust—*i.e.*, in whom the whole muscular system is vigorous (the usual condition)—it must, I think, be allowed the transversales are hypertrophied. The muscle fibres are clearly much longer than in slim individuals; palpation reveals their excellent functional condition—the hardness of the flank muscles is evident when they are made to contract by getting the individual, lying supine, to raise the head and shoulders. Moreover, measurements of the pressure in the rectum show the intra-abdominal pressure is much increased—an increase which cannot be explained by the increase in visceral weight.† Case 5 on my list, is

* To say the separation of the recti is physiological is to beg the question. We might just as well say disease and death, because usual, are physiological.

† And which clearly is not affected by the amount of fat in the subcutaneous tissue.

the record of a young woman, aged 19, exceedingly strong and very stout. She was, it is true, 8 to 10 weeks pregnant; but this cannot be taken as explaining the very high pressures found in the rectum, which in the left lateral position registered as much as 20 to 22 mm. Hg. A comparison of her record with that of another primigravida (Case 11), not stout, but a few weeks' pregnant, shows a very marked difference in the pressures found, indicating the increase of pressure present in robust corpulent individuals. All such corpulent people—and in the absence of pregnancy—show a well-marked hypertrophy of the pelvic floor musculature; that is quite a common experience. Obviously, too, from what we have already said, the recti must be hypertrophied in such individuals. And there is no difficulty in admitting the transversales are similarly hypertrophied. It is impossible, then, to imagine that the increase in volume of the visceral mass—from the slim to the obese—in individuals leading active lives, is associated merely with a gradually increasing relaxation of the transversales: that the muscles in the latter state have only been and are passively relaxed. On the contrary, we see the very opposite has occurred; with the gradual deposit of fat within the abdomen the muscles have become hypertrophied.

An adequate relaxation, occurring for a sufficient time each day —*i.e.*, during the 24 hours—is, as we have said, necessary for the hypertrophy of muscle—for any muscle. Hypertrophy occurs because the muscle has to do more work, or its stimulation is greater; but this work or stimulation must not be continuous; it must be intermittent and in the intervals a sufficient relaxation must occur. This is an essential condition. It is true of every tissue in the body—without adequate relaxation, atrophy or degeneration ensues. The fact that an uncomplicated hypertrophy has occurred in the transversales in corpulency is proof that the muscles have been relaxed sufficiently for a certain period during each day (*i.e.*, at night) whilst the condition has been arising. And we have but to think of the direct effect of the elongation of the muscle fibres on their tone, to which we have referred and which is true of all striated muscle—an elongation which must necessarily occur in the transversales with the gradual increase in volume of the visceral mass, due to the deposit of fat—to perceive the mechanism of their hypertrophy. It is caused by the gradual increase in volume of the visceral mass, which by stretching the muscle fibres of the transversales (*i.e.*, increasing their length) determines their increased contraction (tonic and other) during the active part of each day; but which occurs so slowly that it does not interfere with an adequate relaxation during the resting part, that is, during each night.

But the condition in pregnancy is different. The separation of the recti shows at once that the muscle fibres of the transversales have not passively relaxed as the contents of the abdomen have been

increased by pregnancy (as Hörmann and others would have us believe). But it shows much more than this. It shows these muscle fibres have not adequately relaxed even for a sufficient time each day (24 hours)—at least during the period that separation of the recti has been occurring—to ensure their uncomplicated hypertrophy; they have not relaxed as much as they do in the transition from the slim to the corpulent state! They have not only not relaxed, they have actively resisted the distension; they have been forcibly stretched by the increase in volume of the visceral mass, caused by the rapid rate in growth of the pregnant uterus. For if these transverse fibres had been able to relax sufficiently even for a part of each day, not only they, but their aponeurosis, would have hypertrophied. During such relaxation their pull on their median and anterior aponeurosis would have been lessened; during their increased contraction (during the active parts of the day), their aponeurosis would have been able to withstand the strain the muscle fibres cause. Thus, no separation of the recti would have occurred. But, if the muscle fibres do not sufficiently relax at any time, if they continuously resist the distension and are consequently forced to stretch —because the distension is progressive—the whole fibro-muscular mechanism suffers, a stretching of the whole occurs, and the separation of the recti becomes intelligible.

When a muscle becomes continuously stretched, it undergoes degeneration—regression (Bland-Sutton); it becomes atrophied, not only it, but its tendon or aponeurosis. That such actually occurs in the flank muscles of the abdominal wall, during and because of pregnancy, is shown by the condition of the abdominal wall after pregnancy; it requires no further remark. So too, the bulging of the parts between the recti during pregnancy, when the head is raised from the couch, shows the thinned-out expansion is incapable of withstanding the increased pressure within, caused by that movement. So also the similar bulging of the muscle outside the recti, so often to be seen with the same movement, is evidence that the muscle fibres themselves have suffered. These conditions, however, are not seen so much in primigravidæ as in multigravidæ, in whom the muscles have already suffered. Moreover, they are late manifestations, not early ones of pregnancy.

Thus we are forced to regard the transversales in pregnancy, at least during the latter months, as undergoing an atrophic or degenerative change; theoretical considerations and actual experience show it is so. The muscles clearly are not in a state of uncomplicated hypertrophy as they are in corpulency. Nor are they capable of the same amount of increased contraction. This is indicated by the pressures obtained in the rectum produced by straining and also by lifting weights. One cannot but be surprised by the relative low values obtained in pregnant women, as compared

either with the non-pregnant with flat abdomen or in those who are fat (compare Case 9 with Case 11 in my list). These differences are, it seems to me, only to be explained by a loss of strength in these muscles occurring as pregnancy advances. But with this, their tonic contraction—*the contraction that persists during rest*—is increased; the same two cases show the difference well. The increased pressure is not caused by the recti alone, for it is present in the left lateral position, in which the recti are relatively slack.

This increase in tonic contraction—*the contraction of rest*—the effect of which is to maintain a correspondingly high pressure within the abdomen so long as the increase in tone continues—is due to the continued stretching of the muscle fibres, which, as we have seen reason to believe, even persists, at least to some extent, during resting conditions, preventing an adequate relaxation. That this is so becomes clear when we reflect on the rapid rate of increase of the pregnant uterus, and remember that this is continuous. It does not cease until the end of pregnancy; and whether we consider its effect on the transversales during resting conditions or during activity, these muscles are alike in evil case. If there were reason to believe fœtal growth ceased or diminished during rest, that is, during sleep, it would be different. But, on the contrary, the probability is that it is just at this time considerable growth occurs; for then the pressure within the woman's abdomen although high, is yet lower than at all other times. The fact that children are generally larger in multigravidæ, in whom intra-abdominal pressure is less, than they are in primigravidæ, in whom this pressure is greater—because the muscles in the former are not in such a good functional condition, having been previously stretched and so damaged—supports this opinion. It is reasonable to suppose fœtal growth can occur more readily when the pressure about the fœtus is less than when it is greater.

If this is so—and I know of no reason that indicates the opposite—we have a ready explanation of the cause of the persistent increased tone of the transversales. For when the uterus has grown so large as to have begun distending the abdominal wall, its continued growth, especially at night, will continue to keep the transversales on the stretch. In spite of the relaxation that should occur during sleep, the continued growth of the uterus takes up, so to speak, the spare room so afforded, and prevents the pressure falling—by keeping the muscles on the stretch, it maintains the pressure high. We have already seen that in the lateral position (the usual one in sleep) the length of the recti muscles is reduced, and that this position causes a bulging of the belly wall anteriorly with an increase in length of the muscle fibres of the transversales. We have already referred to the direct effect of this elongation, this stretching, on the tone of the muscle fibres. All these conditions taken together explain the condition of the transversales.

Even if it be supposed that the transversales do become sufficiently relaxed at night, it is clear they must be continuously stretched during the day—the fœtus grows during some time or other. When the woman is up and about it is clear the conditions must be worse for the transversales than during the night. In the erect posture the girth of the abdomen is greater than when lying down. Olshausen [16] has made measurements, and finds that in primigravidæ an increase of 4 to 7 cm. occurs, whilst in pregnant multiparæ it is 10 cm. Thus, it is clear the muscle fibres of the transversales are more stretched when standing than when lying down; so also on account of the flexion of the spine they become even more stretched in the sitting postures; thus is their tone reflexly increased. Obviously, if the fœtus grows most during the day, the transversales must suffer. It is, of course, well known that in spite of the rest during sleep, muscles may not be able to sufficiently recuperate to withstand the effects of overwork during the day; the stretching of the tibialis posticus as the result of prolonged standing with the production of flat-foot, is perhaps the best example I can give.

Thus, in pregnancy, we have a condition in which the transverse fibres of the abdominal wall, like the recti, should result in an uncomplicated hypertrophy; but which, on account of the rapid fœtal growth, is interfered with, and results in a complicated hypertrophy —an hypertrophy in which the tonic contraction is persistently increased, and in which consequently a degeneration ensues. Thus the pressure conditions in the normal are reversed. During rest the pressure remains high, when it might with advantage be low; during movement, when the pressure usually rises very considerably, it does not do so. The condition seems to be one of spasticity, allied to such as occurs in spastic paraplegia, in which the muscles (of the legs), though continuously and excessively contracted—causing the rigidity —undergo an atrophic change, which if the lesion persists, at length leads to their complete atrophy. In paraplegia, the condition presumably arises from the interruption of inhibitory discharges from the higher centres to the nerve cells in the cord supplying the leg muscles; in pregnancy, the condition of the transversales is due to the persistent stretching to which they are subjected, caused by the progressive and rapid increase in volume of the visceral mass.

Here, too, must be mentioned the influence caused by taking food. The additional increase in volume of the visceral mass so produced is probably of real importance. Whilst it has been shown that reflex relaxation of the abdominal wall (and thoracic diaphragm) occurs when the non-pregnant individual takes food in moderate quantities—that is, in individuals in whom a spastic condition of the transversales does not obtain; this has not been shown to occur in pregnant women. Such relaxation may occur. We can readily admit it does so during the first three months of pregnancy, and

possibly it does so in the last. But I should like to know if it does so during the other five months. That ingestion of food, in anything like large amount (*i.e.*, large in volume), should cause anything but an increase of pressure, would surprise me. It is difficult to believe that even a moderate amount would not cause a rise of pressure. I cannot but think that if the amount taken be excessive, and that if this be often repeated (and some pregnant women have big appetities) that the resulting increase in volume of the visceral mass would cause such a rise of pressure as to be the turning point of a pregnancy, normal in all respects as we now speak of it, into an abnormal and dangerous state.

There remains yet to consider the thoracic diaphragm. That the superficies of the diaphragm is increased in pregnancy is shown by the enlargement of the thoracic base, the elevation of the central tendon, the increased bulging of the cupolæ into the chest. My measurements show a considerable increase in girth of the thoracic base has occurred; but it is not so marked as the increase at the level of the umbilicus. The cases are, however, few, 3 ins. and 2½ ins. occurred in Cases 6 and 9; 5 ins. was the difference in Case 19—the second case of the toxæmia of pregnancy. I have not made any measurements as to the height of the diaphragm during and also after pregnancy, as I might have attempted. But Stengel and Stanton [24] have shown that the heart and so the diaphragm are pushed up in pregnancy—more so in primigravidæ than in multigravidæ. It is therefore clear that the muscle fibres of the diaphragm have become longer. To suggest that this is due to a passive relaxation, if the argument advanced in the case of the transversales be valid, is absurd. Indeed that the thoracic diaphragm has passively relaxed is unthinkable. The only reasonable condition to expect in the diaphragm—for as far as I know no post mortem examinations have been made on pregnant women in this respect and so no direct comparison with the non-pregnant is possible—is either that the diaphragm is hypertrophied, or that it has also undergone a spastic change like the tranversales, in either of which its tonic contraction would be increased, but more so in the latter than in the former; but for our point of view it does not matter which has happened.

There can, I think, be no doubt that in corpulent people the diaphragm is hypertrophied; when it becomes weakened in such cases we see what happens—dyspnœa occurs. It is impossible to think but that the diaphragm is hypertrophied in singers, who are usually stout; but they do not expire with their diaphragms. The diaphragm becomes hypertrophied to resist the action of the hypertrophied abdominal wall. The mere lengthening of the muscle fibres of the diaphragm, produced by increase in volume of the visceral mass, must result

in their increased tonic contraction, and must cause an increased compression of the abdominal viscera—pressing the epigastric viscera downwards, preventing, or tending to prevent, them rising into the chest. Obviously the diaphragm has to prevent the epigastric viscera from encroaching upwards into the chest. We have already seen that the increased tonic contraction (spasticity) of the transversales in pregnancy results from a too great stretching of its fibres, which it resists. Clearly, it must tend to force the epigastric viscera upwards into the chest where the pressure is negative; it cannot force them downwards. If the diaphragm were not to resist this visceral ascent, the negative pressure in the chest would not be able to be maintained, and the heart and lungs would cease to function.*

The enlargement of the thoracic base in pregnancy was supposed by Matthews Duncan to be primary, to be caused by the thoracic muscles so as to make room for the growing uterus, and so to prevent a pressure on the liver and other viscera. And Schatz thought the intercostal muscles hypertrophied for the same end. It is, of course, true that an expansion of the chest in the non-pregnant does cause the pressure in the stomach to fall; and if the expansion be made with the glottis closed so that no air can enter the lungs, the pressure in the stomach may become negative. And in the earlier months of pregnancy such an active expansion of the chest may unconsciously (reflexly) be made, and probably is made, by the individual to relieve the tendency of the abdominal pressure to rise; just as in ourselves it occurs when too large a meal may have been eaten; extension of the spine and elevation of the chest into a more inspiratory position does relieve the unpleasant sensations of fulness. But it is impossible to suppose that this can go on *ad infinitum*. As we have seen, we have very good reason to believe the reverse is the case. The thoracic base is not only expanded by the muscles

* Since the above was written, I find an hypertrophy of the thoracic diaphragm in pregnancy has been observed. In a paper on "The Functional History of the Cœlom and the Diaphragm," Dr. Wood Jones says: "Post-mortem evidence may also be obtained of the action of the diaphragm in the expulsion of the fœtus. I have seen in many cases multiple hæmatomata of the diaphragm in women who have died either in child-birth or after confinement. Even in a woman of 37 who aborted at 4½ months, as the consequence of an operation, the diaphragm was markedly thicker than that of a virgin of 19 examined on the same occasion; and, in addition, the diaphragm of this woman showed a series of large hæmorrhages in the muscular portion, each hæmorrhage being due to the rupture of muscular fibres.

"From the evidence at my command (which I readily acknowledge is altogether insufficient to warrant dogmatic statements), I should think it highly probable that some hypertrophy of the diaphragm takes place during the later months of pregnancy, and of the severe expulsive efforts of the muscle at the completion of pregnancy there can be no doubt." (10.)

of the chest wall, but much more by the increasing volume of the abdominal visceral mass. It cannot be believed that this progressive increase can stretch the transversales and other flank muscles as it obviously has done and yet have no effect on the thoracic base. The marked widening of the costal arch and the stretching of those fibres of the transversales which run from one side of it to the other behind the recti is evidence of the contrary.* The intercostal muscles hypertrophy because in the presence of such a mass in the abdomen it is more difficult to cause an entry of air into the lungs. They expand the chest laterally and antero-posteriorly, so that extra room may be afforded in these diameters now that the vertical is encroached upon. So also the tonic contraction of the diaphragm is increased, for the same end—to limit the diminution in the vertical diameter.

IV. *Conclusion. The fallacies to be guarded against in the interpretation of the pressure-values found in the stomach in pregnancy; and the variations in pressure to be expected at different times of pregnancy.*

That the intra-abdominal pressure is raised in pregnancy, and in a very considerable degree, is clear from these considerations. The abdominal wall musculature and thoracic diaphragm, in virtue of their increased tonic contraction—a contraction obtaining quite apart from bodily movements, associated either with general activity or with visceral acts (straining, vomiting and cough), and which is persistent during so-called rest—cannot but compress the viscera placed between them to an extent much greater than occurs in non-pregnant women under similar conditions. Even in corpulent non-pregnant people, it can be postulated quite certainly that the pressure in the stomach is greater than in slim individuals. Indeed, clinical experience itself furnishes an indication of this, in the incidence of such conditions as ptosis and dilatation of the stomach, which are much more common in thin than in stout individuals. So much is this the case, that whilst the former may be said to be predisposed to this disease, the corpulent, because of the increased tonic contraction of the abdominal wall and diaphragm, are safeguarded from it. An increased volume of the visceral mass alone would not cause this difference; it is the reaction of the muscles to this increase—their hypertrophy—which determines it. Clearly, the tone of an hypertrophied muscle—the persistent contraction during rest—is greater

* It is significant to notice that here, in the normal, the median aponeurosis is so much reduced in width, that towards the ensiform cartilage, the muscle fibres of the transversales, arising from one side of the costal arch pass into the corresponding muscle fibres arising from the opposite side without the intervention of fibrous tissue. (Quain's "Anatomy.")

than its tone when not hypertrophied. But in pregnant women we have an additional factor at play; we have an increase in the tonic contraction of the transversales over and above that due to its hypertrophy, an increase resulting from its spasticity, which only lessens as its degeneration occurs, and which before this happens must cause higher values to be maintained even during resting conditions.

The importance of a correct interpretation of the separation of the recti, which indicates this spasticity, is obvious; indeed, the conception that the intra-abdominal pressure causes pernicious effects in pregnancy may be said to stand or fall on this. For if a separation of the recti did not occur, if the muscles simply hypertrophied in pregnancy, that would be evidence a sufficient relaxation occurred during resting conditions which would allow a corresponding diminution of the pressure within.

I have thought long over this and of the condition of the transversales in pregnancy; and believe the interpretation given of the separation of the recti is the true one. Such being the case, it is unnecessary, for our present purpose, to go further; it is unnecessary to make exhaustive examinations of the pressure in the stomach in pregnancy, for we have proof without that that the pressure is raised in pregnancy. But this, no doubt, ought to be done; and I have no doubt whatever that the pressure found will be higher than in the non-pregnant, as Moritz's figures indicate.

But there are two sources of fallacy to be guarded against in reading the significance of such observations. Taking the pressure in the stomach is an unpleasant and trying business. I have had a tube passed into my own stomach (I tried to pass it twice myself, but failed), and I can vouch for the unpleasantness.* But this is not all: the important point is, it upsets one. The nausea and vomiting cannot but affect the tone of the abdominal wall and diaphragm. One is likely, therefore, to get too low values. Even after the tube may have been down some time and the patient has become somewhat accustomed to it, one cannot be sure that the values found represent the pressure under ordinary circumstances. As long as the nausea remains one cannot believe the tonic contraction of the enclosing musculatures is as great as when no such influence is at play. This objection does not apply in the case of the rectum; a small bag in the rectum attached to a rigid tube in the anal canal

* I measured the pressure in my own stomach to verify Moritz's statement that the pressure in the left lateral position is so much greater than in the right. This, I confirmed. From this little experience I learnt a 'tip' of value. The tube should be passed in stages, and at each stage the patient should take a deep breath with the glottis closed. No air enters the lungs, but the increased negative pressure in the chest dilates the œsophagus, and the tube slips down well.

causes very little, indeed no discomfort, and does not upset one in the least. That this is so is shown by the earlier pressures found in the stomach of a single woman, pregnant near term; the only case I have examined. She was aged 20, and expected to be delivered in a day or two. The circumference of the abdomen at its greatest part (2 to 3 ins. above the umbilicus) was $42\frac{3}{4}$ ins., increasing to 44 ins. on inspiration. Considerable separation of the recti—5 ins. or more—was present. The patient was fasting—had had no breakfast. After cocainizing the pharynx, a stomach tube with two openings (but with no bag attached to its end) was passed. After the tube had entered the stomach it was connected with a mercurial manometer, and a little air was pumped into the stomach. The following pressures were found in the sequence given:—

Sitting, leaning back	2 to 4 mm. Hg.
the pressure gradually rose to	6 to 9 mm.
when the heart beats were distinctly seen in the manometer.*	
Standing,—the mercury falls to	2 mm.
Flat on back	10 to 12 mm.
Left side	12 mm.
Back, again	14 mm.
Right side	8 mm.
Back	12 mm.
Left side, heart pulsations visible, and respiratory excursions marked	14 mm.
Back, faint indications of heart beat	12 mm.
Right side	8 mm.
Right side, 'quite comfortable' ... ... (respiratory variations seen, but not heart beats).	6 mm.
Left side	14 to 16 mm.
Back	8 to 10 mm.
Sitting upright	6 mm.
Sitting and leaning forwards, as crouching ...	10 mm.
Sitting bolt upright	6 mm.
Standing up	6 to 8 mm.
Sitting down	8 mm.

It is clear from the figures, the earlier readings were too low; after some little time they became higher. But I could not be sure they were as high as they might have been. All the time the patient looked very bad, in spite of admitting for one reading she was

* The appearance of oscillations in the manometer, corresponding with the heart beats, shows quite clearly that the stomach wall itself was relaxed, and that the rise of pressure was due to an increase in tone of the abdominal wall and diaphragm.

"quite comfortable"; she suffered from almost continual nausea, with occasional attacks of retching and vomiting, so it was not surprising to get such low values. But in spite of this, there are indications that the pressures found were higher than usually obtains in the non-pregnant. The approximation of the values for the left and back positions, although greater than in the right, affords some evidence of this. The patient, too, was fasting; and the examination was not made early, but late in the morning, nearer noon than ten. Moreover, she was mentally very distressed at her condition, wishing her life was at an end.*

But even admitting the pressures found in this case were not so much lower than under ordinary conditions, as I venture to suggest, there is another source of fallacy arising from the assumption one is only too likely to make—namely, that the pressures found in the stomach at term represent the highest pressures that may have existed during the preceding months of the pregnancy. This, however, is no such criterion. The separation of the recti is an indication that a degenerative change had occurred in the transversales, which is progressive until birth; and low pressures found in the stomach near term may easily be due to the resulting weakness of these muscles. Obviously, a weakened muscle will stretch more readily than one not so weak; and a yielding due to stretching, just as that due to a passive relaxation, must be associated with a tendency of the internal pressure to fall.

We have already given evidence that such weakness occurs; the fact that the pregnant uterus during the last month (usually last week or two) becomes lower in the abdomen is further evidence. The uterus is said to drop; but that is an inaccurate description. The lower uterine pole does not become lower; in primigravidæ it is already in the pelvis and cannot get lower. What has happened is this: the abdominal wall has yielded—not relaxed, but stretched—and the fundus of the uterus has been pressed downwards and forwards by the diaphragm, causing an increased bulging of the abdominal wall. With this we cannot expect anything but a lowering of the pressure in the stomach. But there is another factor besides the progressive weakness and yielding of the muscles to be mentioned in connection with this fall of pressure near term—the diminution in rate of increase of the uterine volume, or perhaps its decline. The former may occur as a slackening in the rate of fœtal growth; instead of increasing so much in mass, it consolidates; but the longer the pregnancy, presumably the larger the child. Whether an absorption of liquor amnii occurs cannot be stated; but it is quite clear what the effect of premature rupture of the membranes, so

* This patient had threatened her life and was thought to have swallowed poison. That is how it was I came to pass the stomach tube. It is obvious such a case cannot be relied on to give maximum figures.

common in primigravidæ, must be. Clearly, it must cause a diminution in volume of the uterus, with a resulting fall in the pressure in the visceral parts above. But these changes occur late in pregnancy. Separation of the recti may begin to show itself in the sixth month of pregnancy, or perhaps before; but it becomes most prominent in the last three months, especially towards the end. And it is during this time that the transversales show sign of weakness; they do not in primigravidæ as a rule show evidence of this before; it is only towards the end of pregnancy that the weakness becomes manifest. The reason of this is that whilst the uterus is growing actively, even the stretching of the abdominal wall does not suffice to allow a fall of pressure.

Thus we may well believe that, other things being equal, the pressure in the stomach in pregnant women, especially in primigravidæ, is not so high in the ninth month as before. In connection with this, it is significant to notice that of the three cases in which Moritz examined the pressure in the stomach in the lateral positions and on the back, whereas the two, which showed values little different from the non-pregnant girl examined in the same way, were in the ninth month of their pregnancies; the one in which higher values were obtained and which were all about the same, was in the eighth month of her pregnancy. She was, it is true, a secundigravida, whilst the others were primigravidæ; but does this render my argument invalid? I do not think it does so. This is but a single case, Moritz's isolated example; but it is significant. So also, in the case I examined, a great separation of the recti had occurred, and the patient was at term. Is it unreasonable to suppose that a month before the pressures in the stomach were higher than I found? Not only is such a supposition reasonable, but it is highly probable.

There are but two other points to notice; and the first is this. The spastic condition of the transversales which leads to separation of the recti and their own weakness, must arise before separation of the recti begins—for this latter is a consequence of the former. We cannot believe that before this happens the transversales are not hypertrophied, that they have passively relaxed. As long as an adequate relaxation does occur—and obviously it must do so in the earlier stages of pregnancy—such hypertrophy will continue; just as it does in cases of corpulency. But when an adequate relaxation ceases to occur, spasticity begins; and this presumably goes on some time before the recti begin to separate and the muscle fibres to stretch—for neither yields at once. Therefore it is not unreasonable to expect high pressure values in the mid-period of pregnancy. And the last point is this. Just as the tone of a muscle when hypertrophied is greater than when not hypertrophied, so much the easier or more readily will that muscle when hypertrophied be affected by the causes which lead to its spasticity. In well-developed women,

therefore, a greater degree of spasticity is to be expected than in those who are not well developed. And it is just in the well-developed women, in whom as a rule the pressures in the rectum are found to be most raised and in whom the toxæmia of pregnancy is so liable to occur.

Thus, measurements of the pressure in the stomach in the late, or in the last month of pregnancy, are not likely to indicate the true state of affairs during the preceding months of that pregnancy. To obtain a true picture many observations should be made throughout pregnancy on a series of individuals, best on primigravidæ. To carry out such a research would be almost impossible. The only sort of place in which it could be done is such an institution as I have mentioned; but to attempt it, I fear, would cause a mutiny. Still, even single observations are of value, if done with care, and if accompanied with the necessary details of the physical condition of the patient. Especially would such be of value in cases in which excessive pressures are suspected. No doubt those obstetricians in charge of much clinical material may find opportunities for undertaking or assisting in a research so important, and so full of promise for a real advance in obstetric medicine.

REFERENCES.

1. Braune. (*a*) "Messungen über die Kraft der peristaltischen Bewegungen des Dickdarms und der Bauchpresse." *Centralbl. f. d. med. Wissensch.*, 1865, p. 913. (*b*) "Die Oberschenkelvene des Menschen in anatomischer und Klinischer Beziehung," Leipz., 1871.
2. Dally, Halls. "The Diaphragm in Man." *St. Bart.'s Hosp. Reports*, 1908, xliv, p. 190.
3. Dickinson. "Studies of the Pelvis." *Amer. Journ. of Obstet.*, 1889, xxi, p. 907.
4. Duncan, Matthews. "Researches in Obstetrics," 1869, p. 410.
5. Duncan, Matthews. "Hepatic Disease in Gynæcology and Obstetrics," 1879. *London Med. Times and Gazette*, 1879, i, pp. 57-59.
6. Eccles. "Hernia," 1900, p. 191.
7. Hasse. "Ueber die Bewegungen des Zwerchfells und über den Einfluss derselben auf die Unterleibsorgane." *Arch. f. Anat. u. Phys.*, Jahrgang, 1886; Anat. Abt., p. 185.
8. Hertz. "Sensibility of the Alimentary Canal in Health and Disease." Goulstonian Lectures, *Lancet*, 1911, i, p. 1055.
9. Hörmann. "Die Intra-abdominellen Druckverhaltnisse." *Arch. f. Gyn.*, 1905, lxxvii, p. 527.
10. Jones, Wood. "The Functional History of the Cœlom and the Diaphragm." *Journ. Anat. and Physiol.*, vol. xlvii, April 1913, p. 308.
11. Keith. "Enteroptosis." Allbutt and Rolleston's "System of Medicine," 1907, iii, p. 860.

12. Kelling. "Physikalische Untersuchungen über die Druckverhaltnisse in der Bauchhohle sowie über die Verlagerung und die Vitalkapacität des Magens." Volkmann's Sammlung Klinischer Vortrage, *Innere Med.*, 1895, No. 44, p. 487.
13. Kelling. "Untersuchung über die Spannungszustande der Bauchwand der Magen und der Darmwand." *Zeitschr. f. Biol.*, 1903, N.F., 26, 44, p. 161.
14. Moritz. "Studien über die motorisch Thatigkeit des Magen." *Zeitschr., f. Biol.*, 1895, p. 328.
15. Moritz. *Ibid.*, p. 325.
16. Olshausen. "Beitrag zur Lehre vom Mechanismus der Geburt," Stuttgart, 1901, p. 6.
17. Paramore. "The Supports-in-Chief of the Female Pelvic Viscera." *Proc. Roy. Soc. Med.*, Obst. Sec., vol i, 1908; *Journ. of Obstet. and Gyn. Brit. Emp.*, 1908, vol. xiii, p. 39.
18. Paramore. "What is the Pelvic Floor?" *Journ. of Obstet. and Gyn., Brit. Emp.*, 1909, vol. xv, pp. 193, 194.
19. Paramore. "The Evolution of the Pelvic Floor in the Non-mammalian Vertebrates and Pronograde Mammals." Hunterian Lectures, *Lancet*, 1910.
20. Paramore. "The Pelvic Floor Aperture." *Journ. of Obstet. and Gyn. Brit. Emp.*, August 1910.
21. Paramore. "The Intra-abdomino-pelvic Pressure in Man." Hunterian Lecture, *Lancet*, 1911.
22. Schatz. "Die Factoren, welche die Grösse des intra-abdominaler Druckes bedingen." *Arch. f. Gyn.*, 1872, Band iv, Satz. 46, p. 437.
23. Schatz. "Beiträge zur physiologischen Geburtskunde. *Ibid.*, p. 74.
24. Stengel and Stanton. "The Heart and Circulation in Pregnancy and the Puerperium." *Univ. of Pennsylv. Med Bull.*, September 1904, xvii.
25. Symington. "The Abdomino-pelvic Cavity." *Journ. Anat. and Physiol.*, vol. xlvii, January 1913, p. 153.
26. Viet. "Klinische Untersuchungen über den Vorfall der Scheide und den Gebärmutter" *Zeitschrift für Geburts. ü. Gynäk.*, Band i, 1877, p. 146.
27. Weisker. "Bermerkungen über den sogen. intra-abdominellen Druck." *Schmidt's Jahrbuch*, 1888, p. 277.
28. Wynter. "Absence of Abdominal Respiratory Movement as an Indication of Pericarditis." *Proc. Roy. Soc. Med.*, 1911, iv (Med. Sect.), p. 40.

ERRATA.

p. 85. line 6 from bottom, for "statistical" read "statical."
p. 88. line 11 from top, for "enlightened" read "enlightens."

SELECT CLINICAL REPORTS.

(Under this heading are recorded, singly or in groups, cases to which a special interest attaches either from their unusual character or from being, in a special sense, typical examples of their class.)

Retained Placenta Due to Implantation in a Sacculus or Horn of the Uterus. Manual Removal. Rupture of the Uterus. Hysterectomy and Death.

By V. B. Green Armytage, M.D., I.M.S.,
Resident Surgeon, Eden Hospital, Calcutta.

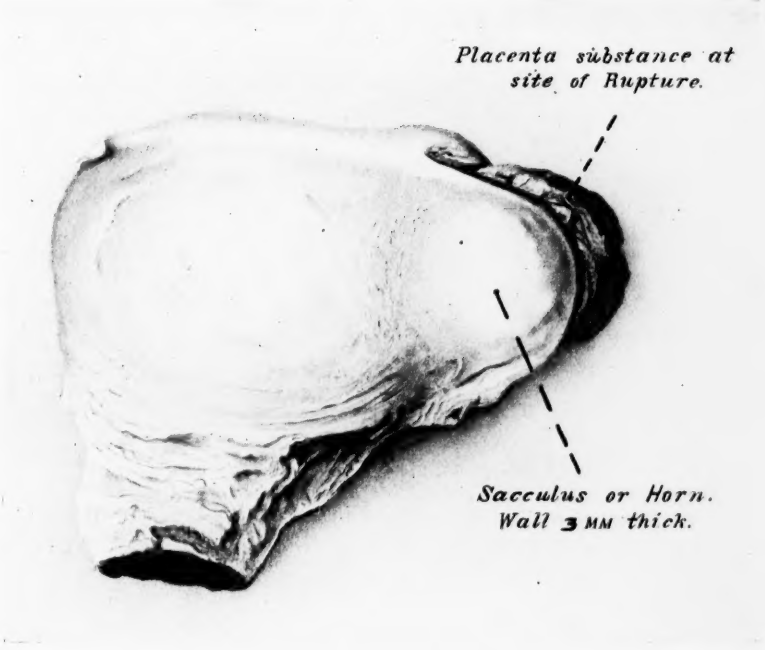
On July 2 of this year a Bengali, aged 24, was admitted in labour. She was seven months pregnant. It was her second child, the first confinement being one year ago.

The patient was well nourished, but there were all over her body the scars of innumerable abscesses; these she said were due to the fact that she was very ill after the first child for six months and was treated after delivery in a Lady Dufferin hospital for pyæmia.

The birth of the child was quite natural, and there was no bleeding. One and a half hours after the delivery, the placenta not having been expelled, the charge nurse sent for my house surgeon to remove it manually. This with gloved hand he prepared to do, but on reaching the fundus he found the placenta to be lying in a sort of *cul-de-sac* in the left-hand cornu of the fundus. On gently attempting to detach it he felt the uterine wall give, and a great portion of the placenta slip away from his fingers into a large rent. A few minutes later I saw the patient; she was almost pulseless, pallid, restless, and in a profound state of shock. Intravenous saline was given, and in twenty minutes after the accident she was on the theatre operating table.

Under chloroform and ether I opened the abdomen. The peritoneal cavity was full of fresh blood, at least 2 to 3 pints; this was rapidly sponged out and then I could see a large rent at the left cornu of the uterus with a portion of the placental substance sticking out from it. Hysterectomy was rapidly done, but before it could be completed the patient expired.

The picture here shown was drawn from the specimen by the artist attached to the Pathological Museum of Professor Leonard



Implantation of placenta in a rudimentary horn or sacculus of uterus. (Showing site of rupture on attempted manual removal of placenta.)

Rogers. It shows very clearly the rent in the uterus with the placenta emerging from behind it together with the thin-walled sacculus at the cornu, the thickness of this wall measuring only 3 mm. against the 15 mm. of the rest of the uterine body.

A portion of the thinned wall was removed by Professor Leonard Rogers, and the following is his report:—

The sacculus of the uterine body at the site of the rupture is 3 mm. thick and is translucent when held up to the light. Microscopic section shows that the muscular wall of the uterus is very considerably thinned and is invaded by large clusters of decidual cells; away from the actual site of the rupture the muscular layers beneath the mucous membrane show hyaline degeneration.

Munro Kerr, in writing of this subject, states that Oswald has recorded thirty-eight cases of rupture of the uterus after manual removal of the placenta. In the case I have recorded the accident was, I consider, almost unavoidable. There is, however, some difficulty in assigning a definite cause. The only feasible explanation I can offer, seeing that the previous labour had been normal as regards the birth of the child and placenta, and that there had been no previous operation or abortion, is that there had possibly been a pyæmic abscess in the uterine wall during the six months of septicæmia from which she had suffered after the first birth, and that this had eventually burst and discharged itself into the uterine cavity leaving a thin-walled scar in the wall in the neighbourhood of the cornu which bulged forming a sacculus. If this theory of a diverticulum or sacculus is false, then perhaps the specimen may be classed as a rudimentary horn.

Dr. Lee, writing on this subject in the latest edition of his book, states that several cases of diverticula of the uterus have been described, and in one case the placenta was developed in an accessory uterine cavity connected with the main portion by a passage. He says that it is probable that these are really cases of a septate or arcuate uterus with an incomplete septum. Incarceration of the placenta in a horn of the uterus has been described before; it is because such a condition was followed by rupture, profuse hæmorrhage and death that I have thought it expedient to put the above case on record. Though doubtless these sequelæ have occurred before, I can, in the literature at my disposal, find no such case recorded.

Fabre and Trillat, in the *Bull. de la Soc. d'Obst. et de Gyn.* for March 1913, quoted in the *B.M.J.* of July 12, speak of the dangers associated with an arcuate uterus in causing incarceration of the placenta, and, although they say that the thin wall of the uterus is insufficient to detach the placenta by its retraction, they give no evidence of disaster being courted or resulting from manual removal thereof.

A Case of Spontaneous Rupture of the Uterus at the Eighth Month.

By V. B. Green Armytage, M.D., I.M.S.,
Resident Surgeon, Eden Hospital, Calcutta.

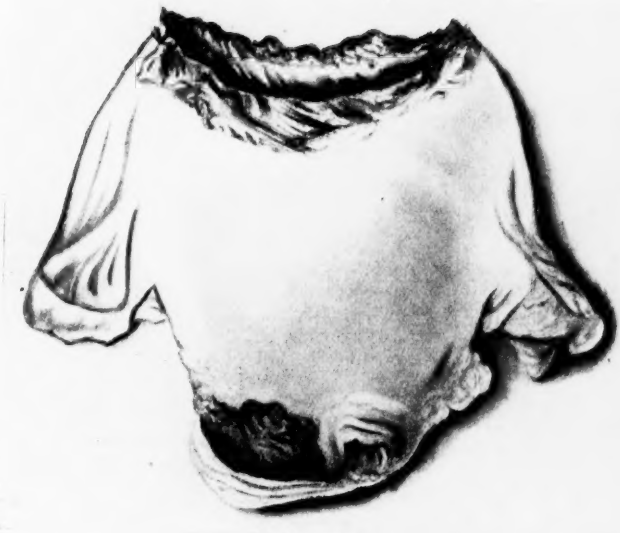
At 12-30 a.m. on July 15 of this year I was called to the Labour Room to see a Bengali primipara, aged 22, who had just been admitted in extremis.

The history given by the relatives was that two hours before, the patient had gone to the bathroom preliminary to retiring for the night. On straining she had felt something give in her belly; this was followed by great pain. She had vomited twice and then became semi-conscious. She was then brought into Hospital as quickly as was possible at that time of night.

On examination, I found the patient cold, bloodless and moribund. There was a soft, doughy tumour filling the abdomen, the size of a full-term pregnancy; fœtal parts were distinguishable, but heart sounds were absent. There was no definable fœtal part in the pelvic brim. Per vaginam, there was no blood discharge; the cervix was not in the least taken up, and would not admit a finger. At 1 a.m. the patient died. I at once opened up the belly, and found a large quantity of freshly-clotted blood in the cavity, and floating among the intestines was a complete fœtal sac with the fœtus *in situ* and the placenta entire on its outer surface. This sac was carefully removed entire and the blood sponged out of the cavity. I was then able to see a large 4 by $1\frac{1}{2}$ inch rent at the fundus of the uterus. The whole uterus, which had retracted to its normal post partum size, was then removed. The accompanying drawing done by the artist attached to Professor Leonard Rogers's Museum will give a clearer conception of the rupture than any description.

The body was carefully surveyed for any signs of injury or syphilis, but with negative results; moreover, the relatives were absolutely certain neither had ever occurred. There was no history of any previous disease of any sort, barring occasional fever.

A portion of the uterine wall at the site of rupture was cut out for section, and the following is the report of Professor Leonard Rogers:—"The uterine wall at the site of rupture shows on microscopic section patches of marked hyaline degeneration, which is, however, irregularly distributed. Deep in the muscle structure there is some small-celled infiltration which is becoming organized in places into fibrous tissue."



Spontaneous rupture at fundus of uterus.

Baisch* has collected 78 cases of spontaneous rupture of the uterus. In 31 of his series the rupture occurred within the first five months of pregnancy. In 32 out of the 56 recorded the rupture was on either the posterior or anterior wall of the uterus.

In the above case I am reporting the site of rupture was almost immediately across the summit of the fundus. Beyond the fact that there was in some patches hyaline degeneration post mortem, combined with areas of fibrous tissue, there is to be found in this case, as in other similar recorded cases, no satisfactory cause or explanation.

After note.—The whole specimen has been sent to the Royal College of Surgeons Museum for acceptance.

* Baisch. *Beiträge zu Geb. u. Gyn.*, 1903, vii, 248.

TECHNICAL MEMORANDA.

(Under this heading will be published from time to time notes on points of practical interest in regard to methods of treatment, operative and therapeutic, and on the general management of Obstetrical and Gynæcological cases in hospital and private practice.)

Hysterectomy by Two Suture-Ligatures.[1]

By Robert L. Dickinson, M.D., Brooklyn, New York.

A study of the elimination of waste motions in gynæcological work has been a part of very full notes taken for some years in occasional trips among the clinics of four countries, and in the writer's own operating rooms. How time can be saved with an accompanying increase—not loss—of safety, efficiency and finish is the livest issue in all other crafts, and must be studied in our own. All the way from printed directions for our office patients up to methods of retraction and dissection in the most radical cancer operations there is hardly a detail that is unworthy of consideration. Because of our fifteen minute rule, I must here pass by observations from no small number of operating rooms on equipment, organization and team work, from many offices and out-patient departments on diagnosis and treatment, and omit methods adapted or adopted by the writer, such as simplified, truly intrauterine stems for anteflexion and sterility; easy artificial impregnation; appendicectomy by the single self-inverting " clock-face " suture; cervix repair and cervix amputation by two continuous sutures instead of a tangle of interrupted multiple ties; pelvic floor restorations, primary or secondary, with a single three-layer suture and two knots in all, with its scar invisible by the use of the subcuticular layer; complete amputation of the umbilical cord at the skin edge at birth, with primary union, by a single suture-ligature or serrefines—and other matters of abbreviated efficiency.

This paper will be restricted to simplifications in retraction, in safe-guarding wound edges, in dissecting, in ligating, in suturing and in minimizing of knots in hysterectomy, and almost entirely to the details of vaginal hysterectomy.

1. Read before the Section on Obstetrics and Gynæcology of the International Congress of Medicine, London, August 1913.

Shield retractor. Of the large number of laparotomies seen, no satisfactory guard of the wound edges was observed. Most operators ignore the rough usage involved in dragging at or rubbing past the rim of the laparotomy well. The complete protection furnished by the all-metal square retractor of Franz is inflexible; the cover of oiled silk between two layers of gauze sewed over the wound by Sigwart is thick and becomes pervious; and the effective thin rubber sewed on by Berkeley and others slips about. A fair retractor and a perfect shield for the cut layers and the skin is afforded by a circle of stiffish rubber, reaching an inch within the peritoneal cavity and four or six inches on to the skin, held open by two thin horse-shoe springs bedded in the rubber, one inside the abdomen and one without (Fig. 1). For vaginal work the anal region is covered by a rubber apron sewed or clamped in place.

Dissection. In opening up layers and connective-tissue spaces the Germans snip very freely; very many surgeons in England and America use the gauze-covered finger. The employment of the blunt scissors is a Mayo practice perhaps too little employed. In hernias and cancer hysterectomies the field for this device is wide. Certain dissections of the broad ligament layers are entirely avoidable by the suture-ligature before or while cutting away. This will be noted further on.

Ligation and suturing. One may be pardoned, perhaps, for drawing attention to the rather wide prevalence of two practices that are generally admitted to be wrong in theory. In ligation we now know that the artery needs no crushing, but merely apposition of the walls—yet time and muscle are often seen wasted. In suturing, also, minimum pressure is the motto—coaptation—not compression, not strangulation. It is curious to note that with fine catgut comes, instinctively, catgut gentleness. You can spot the silk user by his drag, by his catgut breaks, by his thick, hard gut. You will see in some places at the end of operation what it is little exaggeration to call scallop-shell wounds. A gutter, or valley, shows for each stitch, with a not inconsiderable ridge between the bristling knots. Contrast this with the evenly-rounded surface of a cervix with cut edges coapted tenderly, or of a perineal or abdominal skin surface held by layer suture or subcuticular suture.

Another study in suturing is the use of a running suture wherever it is applicable. A knot is a nest—a germ nest. A stiff or thick knot is an irritant, the centre of an exudate. Let us study to minimize the number of our knots.

A third live issue is the buried or layer suture where it can be used. Any stitch running from the skin into deeper layers bears seton possibilities. Even though it be impervious yet in principle it bears some resemblance to a drainage strand. Interrupted stitches, stay stitches, buried knots, silkworm, fine silk, linen, silver wire, all

have places of great value. One can pay too high a price for simplicity and absorbability. Yet must we ever look toward these ideals when we sacrifice thereby neither safety nor efficiency nor finish.

Abdominal Hysterectomy.

These general principles, applied to removal of the uterus, bring about—first, marked reduction in the time of operation by combining tractor and suture and ligature in one; second, absence or lessening of raw areas of opened-up broad ligament; third, anchorage of the round ligament, and in appropriate cases the utero-ovarian ligament (or even the ovario-pelvic ligament), to or into the stump of the cervix or vagina in order to swing the stump high; fourth, minimum number of knots and of bulk of foreign material.

The first bite of the suture is usually that which circles the round ligament (Fig. 1). The second stops bleeding from the ovarian artery (Fig. 2). In each case care is taken to bite into and lock into tissue so that the ligature does not slip off a bared vessel. In every case and with every bite the loop must be snugly nestled home without slack or jump or stretch of gut between the bites, except as noted hereafter. Reflux being checked by a clamp on the uterine side, the upper vessels are cut away (Fig. 3). The thin part of the broad ligament is scrutinized. If it exhibits a bunch of varicose veins, sweep number three should encompass them (Fig. 6). We now cut away down toward the uterine, shoving back the bladder in front and peritoneum behind to bare or nearly bare the artery. The next sweep circles it (Fig. 3) and locks home (Figs. 7 and 8). The vessel is cut. The last sweep of the stitch as a ligature circles the vessels just to the side of the cervix (Fig. 4), and should get some grip in cervical or vaginal tissue for traction purposes.

Now one may with advantage repeat the procedure from the opposite side (Fig. 6). And for this reason. These suture-ligatures make convenient cervix tractors, and we may often dispense entirely with other clamps than those used to prevent reflux bleeding. Next, the uterus is cut away, taking care to cone the cervix in such fashion as to leave little or no cervical canal (Fig. 5). The cervix stump swings between two tractors, namely, the ligatures. One of these next approximates the two faces of the cervix crater, taking care to turn into this raw surface the cut ends of the round ligaments (Fig. 7), and it is then tied to its fellow of the opposite side. Finally, the second suture becomes the peritoneal suture and closes in all raw areas (Fig. 9). At any step in the process one may tie the strands, then go on with them. When the cervix is to be removed the same procedure holds good, substituting the word vaginal edge for cervix crater.

The procedure may sometimes be reversed. In such case one

removes the uterus between clamps, coning out the cervix or removing it. The work is then begun by sewing the raw surfaces of the cervical cone together (or whipping the round of the vaginal opening), next circling the lateral vaginal vessels, then securing the uterine, next the round ligament, lastly the ovarian vessels.

The same principle is applied to large uterine and ovarian tumours and pustubes, and to broad ligaments however distorted, by a variation in the procedure. Whenever there would be, between one artery and the next, a gap or space, and this would be crossed by a span of catgut that could not bedrawn taut, each artery can be securely grasped without altering the principle of this method. The vessel is to be caught in one loop, and afterward by a second—the second locking the first by the familiar clove hitch (Fig. 8).

Thus between the location of secure ligations on several vessels there can be lines or areas of mere suturing, all cared for by the same running strands (Fig. 8). The advantage is not only simplicity and speed, but also this: one does away with the curious and general practice of laying open wide raw spaces of connective-tissue and then covering them in later. By coapting before cutting—or immediately on cutting—one closes the denuded areas, as it were, before creating them. One other common habit may be mentioned. Except when it is unavoidable it is hardly good mechanics to clamp vessels on the pumping side, to remove the tumour, and, after an interval, take off the clamp and hunt for the vessel ends. They are concealed. They may retract. They are temporarily compressed and give a false sense of security. And, moreover, one dabs and dabs at raw surfaces. To ligate before cutting and to avoid scrubbing bared areas is right surgery. The ligature suture fosters both.

Vaginal Hysterectomy.

In operations where major mattersare settled our concern is with the details that make for speed and safety, finish and simplicity. To simplify is to popularize. To foster vaginal as against abdominal removal of the uterus (whenever conditions are suitable) is to minimize shock and lower mortality, to do away with most adhesions and all suprapubic hernias, and to restore women to their work far more quickly.

The drawbacks to the lower route have been slowness and fussiness; occasional slipping of ligatures; oozing from broad ligament bases that spread wide open and retract into the bloody dark and wide raw areas left uncovered by peritoneum.

If, however, by means of a long suture-ligature-tractor for each side—of fine, plain catgut, doubled—one sweeps about the vessels while he closes together and climbs and pulls down broad ligament, all by steps in the same process; then cuts the uterus out; thereafter, with one of the same stitches sews the ligament masses together,

closes the peritoneum of the cul-de-sac, and cares for the posterior vaginal gap; with the other unites the anterior peritoneum, anchors the bladder, and cares for the longitudinal vaginal incision, all by running continuous suture—he has, by a succession of well-reasoned movements, planned for the four requisites. The steps are as follows:—

1. Choice of a case suitable for vaginal hysterectomy, adding, in certain instances where vulvar narrowness is the only objection, free incision of the pelvic floor (Schuchard).

2. Selection, for each side, of a long (20 inch) suture of light catgut, such as No. 1, either plain or chromic, double, knotted, on a strong non-cutting needle like a Mayo.

3. The cul-de-sac is opened and the peritoneal gap stretched, or the stalk of a T-incision is carried down the posterior vaginal wall to the bottom of the cul-de-sac, as located by the hooked-in finger tip.

4. Through the anterior cut the bladder is pushed part way back; the anterior vaginal wall is split and freed from the bladder, and the finger works the bases of each broad ligament down to a ligatable quantity.

5. The long suture swings near to or about the utero-sacral ligament and out near the lateral vaginal wall to anchor the loop ready to be tightened. Cervix and stitch are pulled in different directions and a cut made between. This, or a second loop and cut, takes us close to the uterine artery. This sweep bites into tissue to anchor it and then circles the artery, is looped and carefully nestled home and kept taut by the assistant (Figs. 15 and 10). Rarely a second, or locking loop, is employed. Next, the opposite side is treated in the same way. Now the uterus comes down so that the anterior peritoneal pouch is accessible for opening and widening. The fundus is drawn out. The suture either takes two more bites, round ligament in one (Fig. 11) and tube and ovarian ligament in the other (Fig. 16), before one side of the uterus is cut free or else a clamp is applied and after the uterus is out these stitches are taken. One must be careful to puncture and grip good tissue to prevent slipping, for example, in the ovarian ligament. The upper end is now tied, shortening the broad ligament. The suture is not cut, however. The opposite side is treated in the same fashion. Care must be taken that in the jump between the ligating loops safe-guarding the lower portion of the broad ligament and those controlling the ovarian and round ligament vessels, there be no slack or span (Fig 16). In one's earlier trials of this method one may desire to interrupt the continuous suture to tie the uterine with it, then continue upward with it. The tubes and ovaries are left, if desired, or removed by using the fourth or fifth sweeps of the stitch.

FIG. 1.

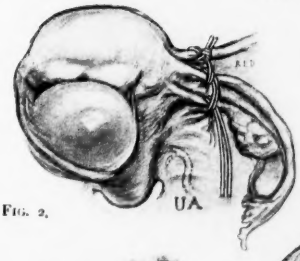


FIG. 2.

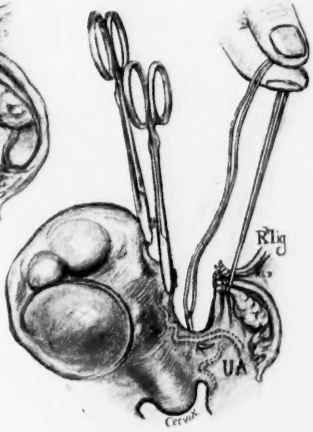


FIG. 3.

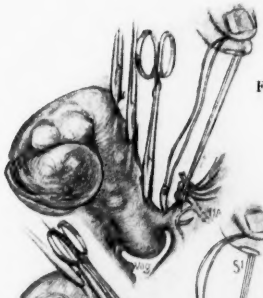


FIG. 4.

FIG. 5.

FIG. 7.

FIG. 6.

Each loop is drawn taut before proceeding, and kept taut, serving also as tractor. FIG. 4—Cervical (or vaginal) vessels caught. FIG. 6—The work may be either front or back of broad ligament. FIG. 7—Into the deeply coned cervix (or open vagina) the round ligaments are made fast.

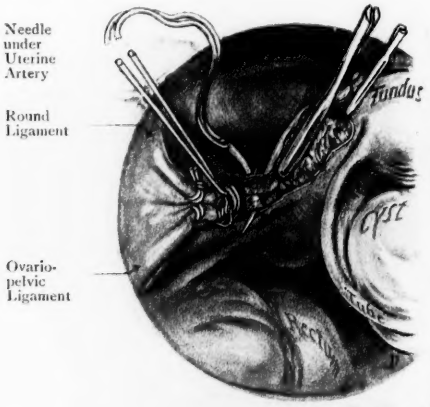


FIG. 8.

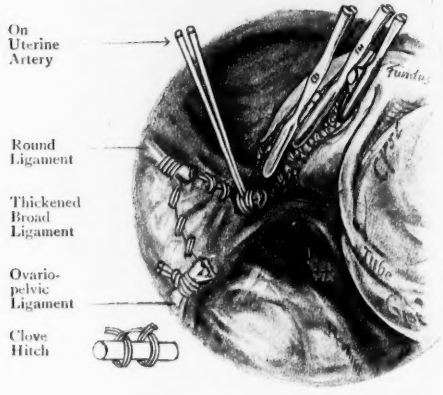


FIG. 9.

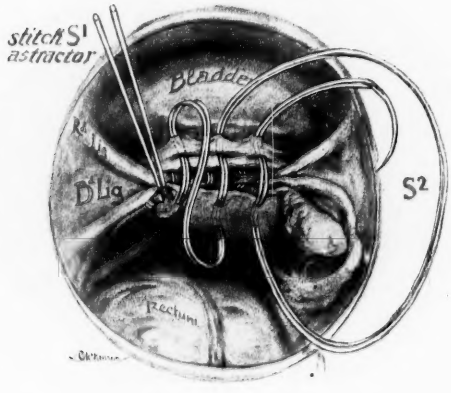


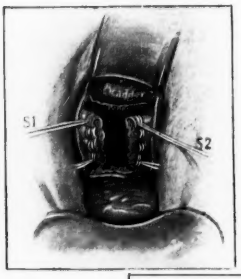
FIG. 10.

View into pelvis—the stitches here drawn thick and large—to show closure of broad ligament at each step of the ligation, and effective tractor action. FIG. 9 pictures the double bite, or clove hitch, used when any slack or line of delicate stitching intervenes between ligature action. FIG. 10—Diagram of peritoneal apposition over stump.

FIG. 11.

FIG. 12.

The continuous doubled suture climbs the broad ligament; the second loop, here restled home, circles uterine artery (UA). Second cut of ligament has been made. Tractor action shown. FIG. 12—A small fundus may be extracted, then round ligament, then tube and ovarian vessels grasped by lock stitch. Or uterus may be first bisected. Or, on upper section of broad ligament, lock stitch may follow clamp and cut.



Quilted broad ligaments ready to be sewed together. After anterior peritoneum is closed (not shown), bladder is sutured to top or rear of this strong bridge, Fig. 12. Cul de sac whipped over, then transverse and longitudinal vaginal openings approximated, catching the vagina up to the ligaments also.

FIG. 13.

FIG. 14.

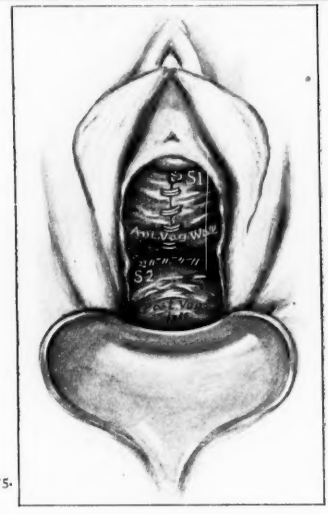
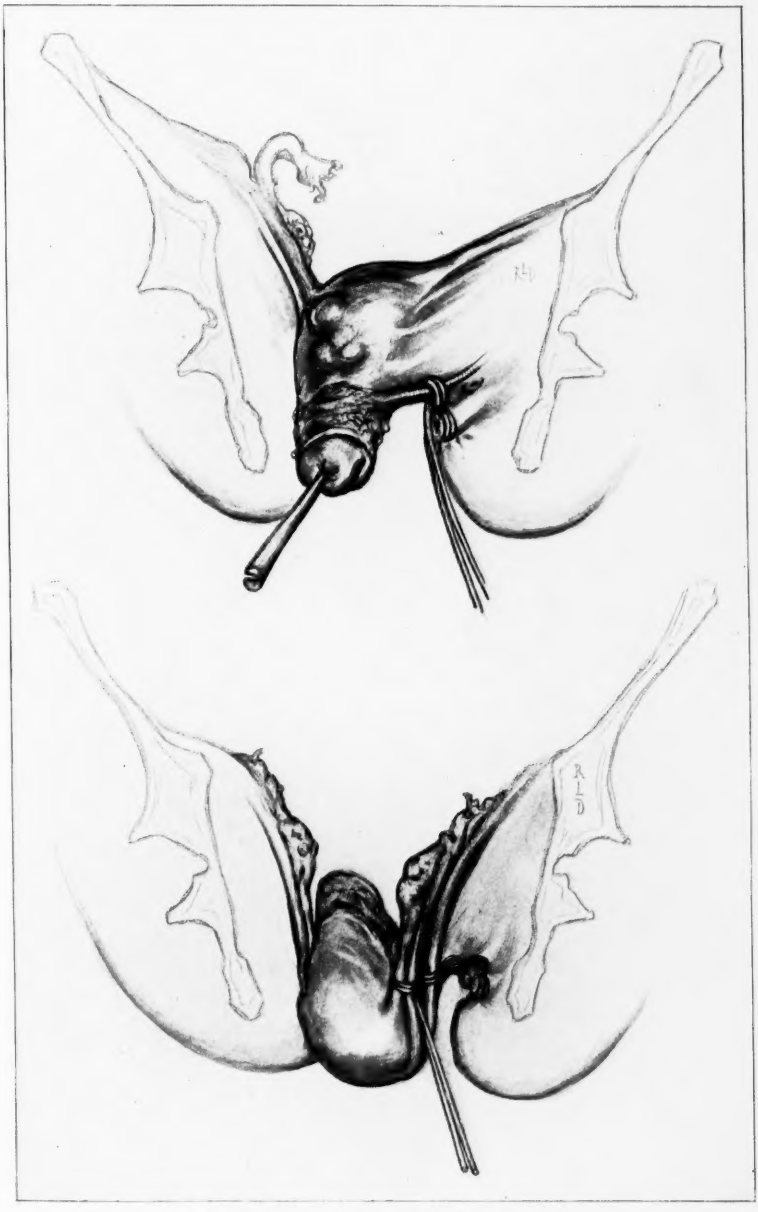
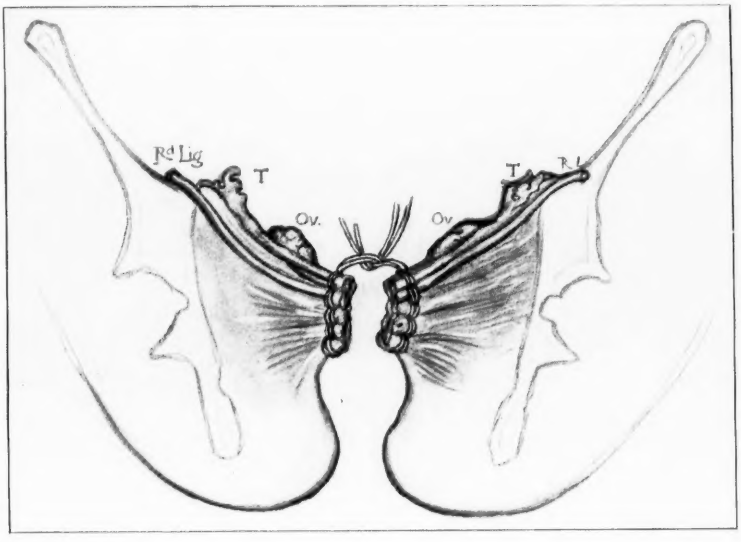


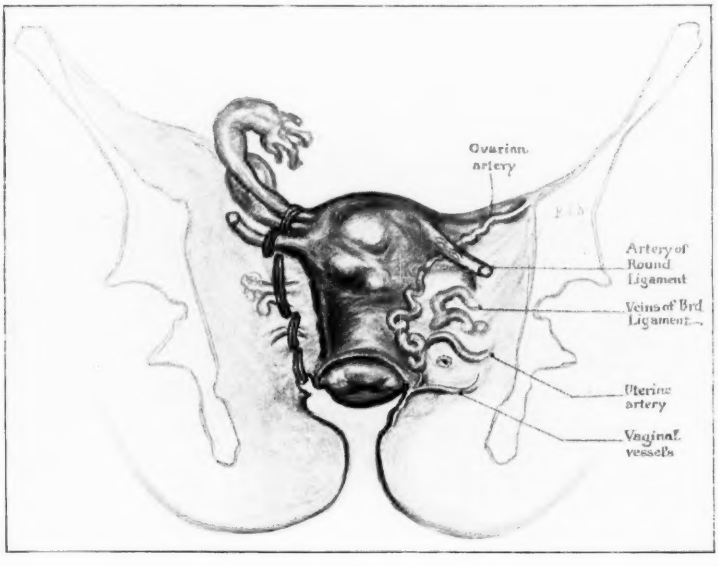
FIG. 15.



FIGS. 16 and 17.

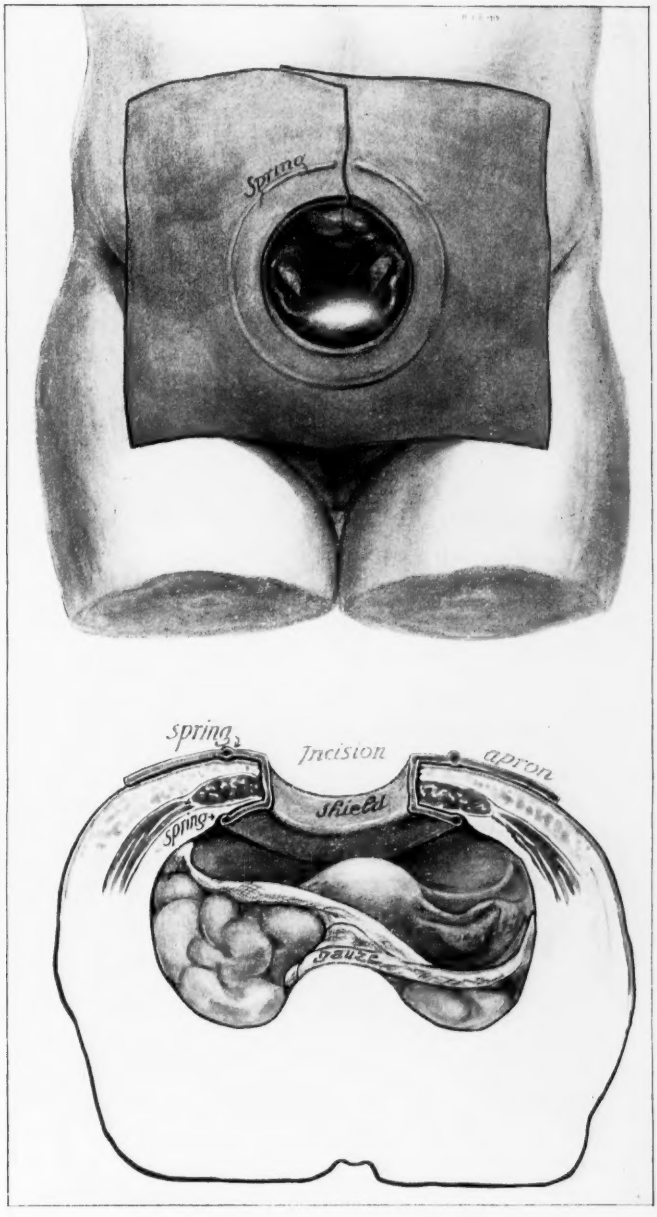
The suture as tractor. The uterine artery looped before cutting. Below, the last suture ligature placed before the uterus is cut away. All five seizures are close together.





FIGS. 18 and 19.

Above, the uterus having been cut away and each ligature tied on itself, the two may be tied together, to form the bridge to which bladder and vagina are sewed. The lower diagram shows the vessels on one side and the upward slope of the interlocking suture on the other.



FIGS. 20 and 21.

The shield-retractor prevents skin contacts and friction and contusion of the faces of the laparotomy incision, and serves as a fair retractor. Metal retractors may supplement it. Incision may be lengthened without removing.

UofM

Mau

Long broad ligaments may require more than four dips of the suture, or more than one suture, particularly when the tube and ovary do not come down well.

6. One needle is now used to close the bladder peritoneum and then the broad ligaments together (Figs. 17 and 12), the other to close the vaginal wall. The more careful the coaptation of mucous membrane the less chance of tender granulation in the vaginal scar. The peritoneal cavity is shut off by this sewing together of the broad ligaments and bladder peritoneum. The vaginal vault and bladder are anchored high to the front face of the broad and round ligaments by these sutures. In an empty pelvis a light vaginal pack may lift the further end of the vagina, but it is not necessary, nor is a drain always used.

7. If cystocele has existed, the bladder base is sewed with one of the above sutures or with No. 1 chromic catgut to the round ligaments or to the top of the bridge of the broad ligaments. In case of prolapse of the bladder its base should be carefully carried over and back of the top of the bridge (on its upper, rear surface) (Fig. 12), and then another tier or a catch or two makes fast to the anterior face of the ligament bridge. All slack is to be taken out of the anterior vaginal wall.

8. If the bladder or vaginal wall lack support, as is usually the case, a firm posterior vaginal wall above an ample perineal body is to be built.

In simple cases, two sutures suffice. I sometimes use more. It is spoken of as a two suture method because the work usually can be done thus. There has been no slipping, no hæmorrhage, no death, in a series of twenty-two cases, and suppuration in only two cases. In old women a tiny cigarette-drain of gutta-percha tissue over gauze is left in two days or more. No vaginal pack is used where a pelvic floor is restored.

These methods are for the expert. He may, perhaps, at the first trial for his peace of mind combine a ligature with this suture. The confidence with which the device has been applied to intra-abdominal work I owe to Dr. F. F. Simpson, of Pittsburg, whereas the vaginal procedure described above is an embroidered variant of the operation of Dr. J. Riddle Goffe, of New York.

REVIEWS OF CURRENT LITERATURE.

UNDER CHARGE OF EARDLEY HOLLAND, M.D.

LIST OF COLLABORATORS:

LONDON Alban Doran, F.R.C.S.; J. B. Banister, M.D.; J. Barris, M.B.; F. E. Taylor, M.D.; C. White, M.D.; J. A. Willett, M.D.; J. Wyatt, F.R.C.S.

EDINBURGH. Miss J. H. Filshill; R. W. Johnstone, M.D.; James Young, M.D.

DUBLIN. R. M. Allan, M.B., Ch.B.

GLASGOW. E. H. L. Oliphant, M.D.

ABERDEEN. W. R. Pirie, M.B.

MANCHESTER. J. S. Young, M.D.; J. Chisholm, M.D.

BIRMINGHAM. H. B. Whitehouse, M.S.; Lewis Graham, M.D.

LIVERPOOL. H. Leith Murray, M.D.

SHEFFIELD. W. W. King, M.B.

DUNDEE. J. A. C. Kynoch, M.B.

CHELTENHAM. C. J. N. Longridge, M.D.

GYNÆCOLOGY.

Treatment of hæmorrhages by blood serums.

WEIL gives his experience (*La Gynécologie*, May 1913) of the treatment of hæmorrhages from the genital organs by means of blood serums.

In 1905 he advocated the administration of blood serum in cases of hæmophilia, basing his opinion on the diminished coagulability of the blood and its rapid increase when fresh blood serum is added to either *in vitro* or *in vivo*. At that time he made use of fresh human blood serum, but this is sometimes difficult to obtain when required in a hurry and does not keep. Since that time various practitioners have made use of this method of arresting hæmorrhage, notably Lapeyre, who published a paper in 1908.

Weil warns that his methods are not a panacea and must be used with discrimination. If the patient's personal or family history does not give any indication that she is a "bleeder" then her blood reactions must be examined for the coagulability, retraction of the clot, or by the length of time a wound bleeds; this last can be obtained by pricking the ear and by counting the duration of the bleeding. For example, if a puncture about 1 mm. is made and the blood drops be absorbed by blotting paper the bleeding normally ceases in about two minutes: if the blood has diminished coagulability the bleeding may continue five or ten minutes or even an hour or more.

Weil employs horse serum: rabbit's blood cannot be obtained in sufficient quantity; ox blood is dangerous and horse blood serum is now on the market and keeps well either as ordinary serum or as hemostyl—the blood serum of a horse bled repeatedly and allowed to recuperate. Failing these anti-streptococcic, anti-tetanic or best anti-diphtheritic serum may be used.

To avoid the risk of anaphylaxis 1 cc. may be injected, to be followed later by a full dose of 10—20 cc. It may be given intravenously or subcutaneously or intramuscularly with the ordinary aseptic precautions. Administration by the mouth is useless, but after the first injection the administration can be kept up by rectal injection, and this is important, for in some cases it may be necessary to repeat the exhibition of the serum every month as in certain cases of menorrhagia. In these cases he administers five doses of 20 cc., on successive days before and on the first two days of the period. The serum can also be applied locally inside the uterus on gauze loosely packed. In cases of hæmorrhage from fibroids special care is necessary, for the blood in such cases is often highly coagulable, as is seen by the frequency of thrombosis after operations for fibroids as compared with other operations : in such conditions an injection of serum might readily precipitate an impending thrombosis. E.H.L.O.

Intra-peritoneal hæmorrhages from the non-pregnant genital organs.

G. Gross and L. Heully, Nancy (*Arch. Mens. d'Obstét. et de Gynécol.*, May 1913), review the literature of this subject. As Lawson Tait and others have pointed out rupture of a gravid tube and tubal abortion are by far the commonest causes of intraperitoneal hæmorrhages and of pelvic hæmatoceles, but more recent observers have established the fact that the bleeding may have other causes.

The hæmorrhage may come from a non-pregnant uterus, as for example in Russell Andrews's "two cases," reported in this Journal, "of retention of menses in which the peritoneal cavity contained free blood." Such cases are admittedly uncommon, but there is a considerable number of cases of hæmorrhage from rupture of a sinus in a myomatous uterus, as in Meredith Littler's and Wallace's cases, also recorded here. Similarly, effusion of blood occurs from the twisting of a fibroid pedicle, or from injury to the tumour from pressure on the promontory. The essential difficulty is the diagnosis, for operation must be early to meet with success.

Trousseau maintained that hæmorrhage sometimes came from a catamenial tube, and though it has been shown that such hæmorrhages are usually from an ectopic gestation it is certain that a pyo-salpinx may contain blood and by rupture cause hæmorrhage : Bazy has recorded such cases, and here again the diagnosis is all important, but unfortunately very difficult if not actually impossible. Hirst operated and saved the life of a woman in whom the bleeding came from a ruptured varicose vein in the broad ligament, but this case remains unique in the literature of the subject.

Hæmorrhage from the ovary might be expected to be more common : habitually there is hæmorrhage into the ripe Graafian follicle, though in minute quantity, often insufficient to rupture the follicle ; this is the origin of hæmorrhagic cysts of the ovary. Not infrequently the rupture of the follicle is accompanied by an oozing of a few drops of blood. From unexplained reasons this bleeding may become excessive, but in certain cases, as in that recorded by Gross and Heully, the ovary was congested and the microscope revealed the presence of dilated and of newly-formed capillaries round the ruptured follicle. Tarantson, in his thesis, collected a dozen cases of hæmorrhage from the ovary, either a normal organ bleeding from a Graafian follicle, an old corpus luteum, or from a diseased ovary (angio-sarcoma). Rupture of blood cysts in the ovary may be due to a slight traumatism, or may occur from simple over-distension as in Doran's

case, where the pedicle was twisted. Sclerosed vessels may be unable to retract and arrest the bleeding.

As to bleeding from a hæmorrhagic peritonitis, the authors have found no evidence to support such a hypothesis, unless possibly Freund's case of tubercular peritonitis. E.H.L.O.

Pseudo-myxoma of the peritoneum originating in the vermiform appendix.

DELETREZ (*Revue de Gyn. et de Chirug. Abdom.*, July 1913) reports an interesting case and gives the literature and abstracts of a dozen recorded cases.

His own case occurred in a girl of eighteen years of age. She had had pain in the appendix region and a palpable tumour for a month—the pain gradually increased and the mass fluctuated. The tumour was incised at its most prominent part but instead of pus about 500 grammes of gelatinous fluid was obtained. The appendix was adherent to the cæcum and omentum and from its tip fluid, similar to that forming the mass, was escaping. Among the adhesions surrounding the appendix a small amount of pus was found. The appendix was removed and the wound drained. For eight days gelatinous material escaped. Convalescence was uninterrupted.

It is generally supposed that the condition results from a stricture at the base of the appendix and subsequent perforation and escape of the mucoid contents without acute peritonitis. Lejars states that epithelial grafts on the peritoneum form a large amount of the jelly in some cases.

The condition is not malignant and the prognosis is as a rule good. It is three times more common in men than in women. C.W.

Primary carcinoma of the vagina and leucoplakia.

LÖHNBERG (*Zeit. f. Geb. u. Gyn.*, Bd. lxxiii, Hft. 3) describes a case of this very rare condition. It occurred in a woman of 55, eight years after the menopause. The symptoms were pain and bleeding of a fortnight's duration. On examination there was found on the anterior vaginal wall an excrescence about the size of a five mark piece. This was removed for examination and found to consist of squamous epithelioma. On the surface there were papillomatous outgrowths, but the deeper layers were comparatively little involved. In the immediate neighbourhood there were areas of white shiny mucous membrane presenting the characteristic appearances of leucoplakia. No actual transition from the leucoplakia to the carcinomatous tissue could be recognized. The vagina and uterus were extirpated, and the patient made an excellent recovery and has remained free from any recurrence for more than two years.

von Franqué recommends the combined removal of the uterus and vagina in these cases, preceded by an incision round the introitus and the stitching up of the vagina. A free paravaginal incision after the method of Schuchardt is employed.

The author draws attention to the suggestive association of the leucoplakia and the cancer, and to the fact that although the superficial papillomatous appearance of the tumour suggested great malignancy, the deeper layers of the mucosa were relatively little affected. R.W.J.

The treatment of leucorrhœa with antifluor.

LIEPMANN (*Gynækol. Rundschau*, 1913, Hft. 15) describes the instrument which he has invented for distributing the powder (antifluor) in the vagina. It is meant to be used by the patient herself and is simple in design and easy to keep clean. R.M.A.

Menstrual post-operative cysthæmatoma.

ROUVILLE and ARRIVAT, Montpellier, contribute (*Arch. Mens. d'Obstet. et de Gynécol.*, June 1913) a description with drawings of a blood cyst removed from a woman aged 35. She had previously had the appendages on both sides removed and enjoyed good health for seven months but her periods had ceased, though at very irregular intervals she had a slight sanguineous discharge. A month before admission she was seized with violent pain in the hypogastrium accompanied by a profuse metrorrhagia which caused her to faint. From time to time this was succeeded by pains and hæmorrhages. At the operation the diagnosis of post operative hæmatoma was confirmed. A mass, the size of a tangerine orange, was found on the right side of the uterine fundus with bowel closely adhering to it.

Microscopic examination showed that the cyst had formed in a portion of ovary, near the hilus, left at the previous operation; the blood vessels were dilated, tortuous, and thrombosed, and the hæmorrhage had probably come from a ruptured follicle. E.H.L.O.

The relation of the peritoneum to the uterine muscle.

F. LA TORRE, Rome, publishes (*Arch. Mens. d'Obstet. et de Gynécol.*, May 1913) his researches on this subject. After remarking that the anatomists have contented themselves with the mere statement that the peritoneum is very closely adherent over the fundus, he proceeds to describe his own researches to find out the cause and if possible to discover if this might be overcome so as to allow of operators stripping off the peritoneum.

La Torre made sections of the fundus uteri from bitches in their three stages of ovarian rest, heat, and post partum. He made use of the stains of Ramon y Cajal, Bielschowsky, van Gieson, and of Weigert, and gives coloured drawings of his sections. These show that the peritoneum sends down processes between the longitudinal muscle fibres at the fundus, and these ramify so intimately that it is quite impossible to strip off the peritoneum. The van Gieson's staining reveals the connective tissue, while the Weigert's stain shows up the elastic fibre element in these processes; the Ramon y Cajal shows both elements, while Bielschowsky's method gives a brownish stain to the so-called Gitterfasern which form a sort of fine reticulum not shown by the other stains: these Gitterfasern are believed to maintain the muscular fibres in close apposition. E.H.L.O.

Etiology of retrodeviations of the uterus in virgins and nulliparae

EUGÉNIE PARISSE (*La Gynécologie*, May 1913) discusses the various causes of retroflexion and retroversion in women who have not borne children. For the most part her remarks and conclusions are what may be found in text-books generally. She draws attention to the effect of metritis on the "muscular prolongation" of the uterus in causing atrophy of the round ligaments. Falls and similar injuries act more easily on persons who are run down in health, and after even an acute inversion following a fall the stigmata of nervous or muscular debility can be found if looked for. Considerable stress is laid upon the nervous system and its influence on displacements, and Doléris is quoted as having collected eight cases of spina bifida associated with prolapse of the uterus in the new-born.

E.H.L.O.

The operative treatment of chronic inflammatory pelvic exudates.

FALGOWSKI (*Gynækol. Rundschau*, 1913, Hft. 15) has treated 23 cases by his method—10 were completely cured, 7 improved, and 6 were failures.

He performs anterior colpotomy and endeavours to free the uterus from its adhesions. Then posterior colpotomy is done and the uterus eventually raised out of its bed of adhesions and any pockets of pus cleared out. In young people the uterus is now kept in normal position by vaginal fixation; in those near the menopause hysterectomy may be performed. The chief success of the operation however lies in free drainage. Gauze soaked in camphor oil is packed in front and behind the uterus. This is gradually removed daily until all has been removed by the seventh day. The tampon is repeated for several weeks longer until the cavity shows signs of closing.

R.M.A.

Ventrifixation of the round ligaments and the Alexander-Adams' operation.

RISSMANN (*Zeit. f. Geb. u. Gyn.*, Bd. lxxiii, Hft. 3) records his experience of one hundred operations for fixation of the round ligaments by a modification of Olshausen's method, and of a similar number of Alexander-Adams' operations. In the former series he had one death. There was no case of recurrence, and in seventeen cases of subsequent pregnancy in thirteen patients he had resort to version in two and forceps in five cases. In the latter series he had no deaths, and no cases of recurrence. He advocates the use of buried silk sutures, which have given him great satisfaction.

R.W.J.

The importance of cystoscopy in carcinoma of the uterus.

LUYS (*Revue de Gyn. et de Chirug. Abdom.*, August 1913), who has designed a cystoscope specially for use in the female bladder, contributes an article on this subject. He advocates the use of a direct vision cystoscope and gives the advantages which this instrument has; among others, he mentions that the true colour of the mucosa is seen, as it is not made pale by distension of the cavity of the bladder, contracted bladders can more easily be examined, cystoscopy is more easily carried out if hæmorrhage is present, local applications can be made to the bleeding points and that ureteral catheterisation is simple.

A complete cystoscopy includes examination of the vesical mucosa, inspection of the ureteral openings and ureteral catheterisation and estimation of the capacity of the pelvis of the kidney.

Invasion of the vesical mucosa by new growth is indicated by increased vascularity and small hæmorrhages and then by œdema, later the actual growth may be seen first as small red spots and finally fungating vegetations.

Œdema of a ureteric orifice—if limited to that spot—may indicate invasion of the ureter above. A similar interpretation may be given to feeble ejaculatory power. Luys states that the size of the pelvis of the kidney can be estimated by injected sterile water and noting how much has been given before a characteristic lumbar pain is produced. A normal kidney holds 5 grammes—anything over 10 grammes indicates hydronephrosis. He does not mention using Rœntgen rays after injecting opaque fluid. He concludes by quoting illustrative cases.

C.W.

Ovarian cysts and tumours.

EHRLICH (*Gynækol. Rundschau*, 1913, Hft. 15-16). This is a critical review of all the literature published in 1911-12. The author pays special attention to the pathological findings and also to the relationships with the uterus and other organs. R.M.A.

Retro-peritoneal cysts of Wolffian origin.

JACQUOT and FAIRISE (*Revue de Gyn. et de Chirug.Abdom.*, June 1913) devote seventy pages to the consideration of this subject and to a full account of their case.

Their patient was a girl of 18 who was sent into hospital as a case of encysted peritonitis. The encysted fluid had been previously tapped and symptoms of acute abdominal infection ensued. She was found to have a fluid tumour in the left loin which extended from the epigastrium to the iliac fossa and intestinal obstruction was present. Some hours after admission laparotomy was performed—a tentative diagnosis of pancreatic cyst having been made. The tumour was found to be free below and not attached to either ovary. Further investigation showed it to be between the two layers of the descending mesocolon. The peritoneum was incised outside the descending colon and the cyst with difficulty removed and the resulting cavity drained. The patient died soon after of peritonitis. At the autopsy the descending colon was found to be separated from the abdominal wall for 15 cms. The space from which the cyst had been removed measured 15 by 25 cms. and was bounded by peritoneum in front and on both sides, behind was the posterior abdominal wall.

The urinary and generative organs were normal; the ureter passed behind and internal to the tumour.

The cyst wall varied from a quarter to one and a half centimetres in thickness and in places small cauliflower outgrowths were present. The cyst contained four or five litres of brown fluid. S.G. 1010. It contained cholesterin and blood.

The authors then give a very detailed description of the histology of the cyst wall, which is illustrated by micro-photographs and sketches. From these it appears that although in places the wall had an adenomatous appearance it was on the whole papilliferous. The epithelium covering the papillæ was cubical and in places probably ciliated.

Bacteriological examination of the contents showed streptococci and coli.

They then discuss the origin of retro-peritoneal cysts and especially those of the meso-colon. A simple blood cyst can be excluded at once because of the epithelial lining of the tumour and similarly a chylous cyst can be excluded. There remain three possible seats of origin of the tumour. (1) Intestine. (2) Teratoma. (3) Wolffian body.

Intestinal cysts. These usually originate near congenital diverticula (Meckel's diverticulum, appendix) or round an accidentally formed diverticulum and contain muscle fibres in their walls. The authors find no muscular tissue or ganglion cells (representing Meissner's or Auerbach's plexus) in the wall of the tumour they were investigating.

Teratoma. They exclude this on account of the simple nature of the tissues forming the tumour compared with the complicated structure found in a teratoma—a teratoma of a single tissue being extremely rare.

Wolffian. They here discuss structures originating from the genital ridge of the embryo. Brigidi, for instance, thinks that some retro-peritoneal cysts originate from accessory ovaries. They incline to a Wolffian rather

than a Mullerian origin for the tumour because growths from Mullerian remains are generally connected with the uterus, tubes or vagina.

They then give abstracts (with references to original publication) of 13 recorded cases of cysts of Wolffian origin—their characteristics are as follows :—

Age. Seven months to 65 years.

Sex. 92·85 per cent. occur in women.

Rarity. They appear to be the most uncommon tumour of the mesentery or meso-colon.

Pathology. The Wolffian body can be divided into pre-sexual, sexual, and post-sexual. In the male the first two form part of the excretory tubes for semen—the last only becomes atrophic as the organ of Giraldès and aberrant tubes of the epididymis. The Wolffian duct becomes the vas. Thus in the male there are few unused parts of the Wolffian body to form tumours and thus the small percentage occurring in men is explained. In the female, on the other hand, the duct, the pre-sexual, sexual, and post-sexual portions of the gland all become functionless, and may form tumours anywhere between the loin and the pelvis according to whether they accompany the ovary in its descent or not. Alban Doran's well-known illustration is given to show the vestigial structures in the broad ligament.

Symptoms. Nothing characteristic can be noted.

Diagnosis. They will have the characters of retro-peritoneal tumours in that they will be fixed and will have resonant areas where the bowel crosses them. The further diagnosis is hardly practical.

They conclude with some suggestions on treatment, which is by total extirpation.

A very full and valuable bibliography, filling seven pages, is given at the end of this excellent monograph. C.W.

OBSTETRICS.

The antiproteolytic substances of the blood during pregnancy.

Gemmeltoft (*Gynækol. Rundschau,* 1913, Hft. 15) summarises his experiments as follows. There is an increase of these substances during pregnancy, which is constant and greatly increased by the toxæmias. In a child's blood the amount is much lower. Pregnant rabbits and cows do not give this increase. These substances are not thermostabile and are precipitated with ether. Subcutaneous injection of trypsin increases these anti-proteolytic bodies—a similar result is obtained after unilateral nephrectomy. The amount of amino acids in the blood hardly plays any rôle in these results, for it is not increased by pregnancy. Gemmeltoft found that Fuld's casein method is not of service in quantitative experiments on the blood serum. The formol method of Sorensen gave much more constant results and was much easier to apply.

Full details of the experiments are given. R.M.A.

The biological diagnosis of pregnancy.

Abderhalden (*Monats. f. Geb. u. Gyn.,* 1913, Bd. 11, Hft. 1) analyses the possible causes of the failures reported by some observers. The following are mentioned as the chief :—

(1) The blood is hæmolytic or centrifugalised.

(2) The filter has not been sufficiently tested beforehand.

(3) The tissue is not free from blood nor from substances, which can be removed by boiling. These react with ninhydrin and form the commonest source of error.

He discusses each point shortly and maintains that thorough attention to these details will give a positive result in every case. As regards the colour reaction, only violet and blue colours must be regarded as positive, and not the reds and browns. R.M.A.

Addison's disease and pregnancy.

VOGT (*Münch. med. Wochensch.*, No. 33, August 1913) refers to the greater frequency of this disease in men, than in women. Primary Addison's disease has never been noted during pregnancy, due probably to the amenorrhœa and sterility associated with atrophy of the ovary in this disease. Secondary Addison's disease has as yet only been found complicating pregnancy in two cases. V. describes those two cases and then reports his own case. The patient, 21 years of age, i-para, showed marked bronzing of the skin. There was no evidence of syphilis. The confinement was normal, after labour lasting 21 hours. On the 11th day of the puerperium there was sudden vomiting, followed by collapse and death next day. The child lived. The P.M. findings are given in detail. The suprarenals showed well-marked tubercular caseation. The pregnancy and labour were normal, the unfavourable symptoms appearing during the puerperium. V. raises the question of inducing labour in such a case, but he finds no evidence that such interference is beneficial to mother or child. J.A.C.K.

Physiological experiments on the pituitary body, especially in relation to pregnancy.

SCHLIMPERT (*Monats. f. Geb. u. Gyn.*, 1913, Bd. 11, Hft. 1) summarises the experiments as follows :—

(1) The pituitary gland of pregnant cows, especially the posterior lobe, does not contain a larger amount of secretion than that of non-pregnant animals.

(2) The active secretion is obtained only from the posterior lobe and never from the surrounding brain substance, which has the same developmental origin.

(3) Its presence can be determined in the fœtal calf as early as the 10th week by the vaso-constrictor action. Similarly in human embryos at the 6th month. There is an influence on the respiratory centre in addition in fœtal calves at the 7th month.

The methods employed and the results obtained are given in detail. R.M.A.

Pituitary extract in labour.

HÜFFELL (*Monats. f. Geb. u. Gyn.*, 1913, Bd. 11, Hft. 1). This is a critical review of the literature on the subject. Special attention is drawn to the physiological and pharmacological properties of the extract. Then the indications for its use are mentioned. R.M.A.

Rupture of the uterus from pituglandol.

ESPUET (*Münch. med. Wochensch.*, No. 32, August 1913) reports the following case of a patient, 34 years of age, vii-para, normal confinements. On examination at the end of the eighth pregnancy, the pelvis was found

to be slightly contracted, vertex presentation, fœtal heart sounds very weak and pains slight. In order to hasten delivery, pituglandol was administered subcutaneously. As no progress was made the dose was repeated in 1½ hours. About five minutes after the second injection, the pains became severe. The patient manifested all the signs of collapse, and from the altered form of the uterus, and the abrupt ending of the pains, the diagnosis of ruptured uterus was made. Abdominal section was immediately performed, when two large lateral tears were found in the uterus involving the cervix and parametrium. The uterus was extirpated. The child was asphyxiated and could not be resuscitated, and the mother died on the third day from general suppurative peritonitis. E. attributes the rupture of the uterus to the repeated injection of pituglandol. The delay in labour was due to a slight disproportion between the size of the pelvis and the head, the former being slightly contracted, and the latter abnormally large. The pituglandol was given in this case in the second stage on account of threatened danger to the child. The dose was not large, 1·1 ccm. being administered twice, at an interval of 1½ hours. J.A.C.K.

Extrachorial development of the fœtus.

Samuels (*Zeit. f. Geb. u. Gyn.*, Bd. 73, Hft. 3), writing from Professor Meyer's laboratory in Berlin, describes three cases of this uncommon condition, and discusses their etiology, along with that of such kindred conditions as hydrorrhœa gravidarum, and placenta marginata.

The condition differs from extra-amnial development only in the stage at which the rupture takes place, the latter occurring before the amnion and chorion have become fused, *i.e.*, before the beginning of the third month, while the extra-chorial development may begin any time after that but before the chorion and decidua capsularis have fused with the vera, *i.e.*, in the third and fourth months.

The author favours the view that hydrorrhœa is usually to be accounted for by a rupture of the membranes above the internal os, rather than by a decidual secretion, inflammatory or otherwise. The study of his specimens does not throw much light on the question of the source of the liquor amnii, or of the fluid in hydrorrhœa, but it is interesting that he did not find the occurrence of any decidual 'endometritis.' R.W.J.

Early abortion.

Wallich (*Revue de Gyn. et de Chirug. Abdom.*, July 1913) emphasises the fact that only early abortions are frequently unrecognized but may have serious results. He lays some stress of the condition of the uterine mucosa in diagnosis and gives several illustrations. C.W.

Induction of abortion and tubal sterilisation by one abdominal operation.

Sellheim (*Monats. f. Geb. u. Gyn.*, 1913, Hft. 2). The indications for interference are first discussed and then the operation is described. After opening the abdominal wall the uterus is incised transversely along the posterior wall between the insertions of the tubes. The ovum is then removed and the cavity packed with gauze, which is pushed down through the cervix into the vagina. The uterine wall being closed, resection of both tubes or resection of one and removal of the other is performed.

The author claims simplicity for this operation over the vaginal or combined vagino-abdominal ones. He has performed it with no bad results on ten cases from one to five months pregnant. R.M.A.

Rare forms of synclitism.

PANKOW (*Monats. f. Geb. u. Gyn.*, 1913, Hft. 2) discusses those cases in which the fœtal head engages in the antero-posterior diameter of the brim. He has observed it sixteen times in 4000 deliveries.

The usual position is that with the occiput behind the pubes, more seldom when the occiput lies in front of the sacrum. Occasionally the same thing is found in face, brow, and breech presentations.

Contracted pelvis may be the cause in many instances; but it may also be due to the fœtal head engaging as the child's back is passing from one side to the other of the uterus.

The mechanism of the anterior position is one of flexion of the head and rotation into an oblique or transverse diameter—then the normal mechanism continues. That of the posterior position resembles an occipito-posterior presentation in every respect.

Many of the cases require no help during delivery. Postural treatment is of little avail. The position may be altered by internal and external manipulations and if necessary the forceps may be applied. R.M.A.

Presentation of the abdomen.

HENROTAY, Antwerp, reports (*Arch. Mens. d'Obst. et de Gyn.*, June 1913) a case in which the abdomen of the child presented and a curious photograph shows the umbilicus and a considerable portion of the fœtus protruding at the vulva: but for the appearance of the other end of the loop of cord passing out of the vulva the drawing might at first sight be taken for one of the placenta being expelled—fœtal surface first, through a distended vulva.

The presentation was originally one of the shoulder with prolapse of the right arm, and awkward attempts at turning were made in spite of the rupture of the bag of waters about twenty hours previously. On admission to hospital the fœtus was found to be dead from prolapse of the cord and the presentation was as described above. The spinal column was hooked out clear of the maternal parts and divided with scissors: the pelvic extremity and then the upper were easily extracted. The fœtus had no liver and part of the intestines were absent: it weighed 2 kg. 800. The perineum was not in the least torn, though the mother was a primipara.

E.H.L.O.

Rapid death during or shortly after labour, with an account of a case of acute necrosis of the pancreas.

H. SPAENGER (*Münch. med. Wochensch.*, July 17, 1913) gives a survey of the causes of rapid death in these circumstances, and describes cases of perforation of, or hæmorrhage from gastric and duodenal ulcers; gangrenous appendicitis, perforation of tuberculous or typhoid ulcers, cerebral hæmorrhage, tumour or abscess, eclampsia or its complications, uræmia, or meningitis.

Cases of *sudden* death are to be distinguished from cases of *rapid* death produced by air embolism or pulmonary embolism.

Then follows the description, both clinical and pathological, of a case of acute necrosis of the pancreas. This is the first case ever described. The patient was a multipara, who had a rapid labour immediately after eating a large meal and drinking a great quantity of beer. Post mortem: there was widespread necrosis of the pancreas, and interstitial hæmorrhages; the liver was also the seat of acute necrotic changes, but the kidneys showed no pathological change.

In discussing the causation, Saenger considers that the patient was predisposed by adiposity and chronic alcoholism; but the exciting cause was probably the rapid lowering of intra-abdominal pressure consequent on her quick labour. The large ingestion of food and beer shortly beforehand was an additional factor in raising the intra-abdominal pressure before labour. By the rapid lowering of pressure, he supposes that a blood vessel in the pancreas was ruptured and blood was thereby allowed to escape into the pancreatic tissue, bringing about activation of the pancreatic secretion, and resulting in necrosis.

Saenger suspects that these cases are more common than supposed.

The conservative treatment of eclampsia.

LICHTENSTEIN (*Monats. f. Geb. u. Gyn.*, 1913, Hft. 2) gives the results of the last two years at the Leipsic Klinik. There were 94 cases with a maternal mortality of 5—5·3 per cent. The fœtal mortality was 37·3 per cent. for all children, and 21·3 per cent. for those born viable. One venesection was sufficient to stop fits in 54 per cent of the cases. 42 per cent. of ante-partum cases were cured and the pregnancy continued. 74 cases were treated in succession without a death.

He then compares his results with those who advocate active treatment, and proves that in every case conservative treatment will give a better result. R.M.A.

Fœtal death due to excessive twisting of the cord.

J. ANDÉRODIAS and R. BRANDEIS (*Revue mens. de Gyn., d'Obstet., et de Ped.*, June 1913). These observers report a case in which it appears to them that the death of a fœtus was due to excessive twisting of the cord. The patient was a primipara of 28 years, who was in every way healthy, and who had a normal gestation up to just before the seventh month. At this time she noticed that fœtal movements ceased. Six days after this she was taken in labour and was delivered the following day of a macerated fœtus.

No cause for the fœtal death could be found from an examination of it. There were no signs of syphilis, and interrogation of each of its parents did not reveal any reason for ascribing its death to this disease.

The placenta appeared to be normal also.

The cord was 40 cm. long and was divided into distinct portions, one towards the placenta which was the longer and was bulky in its entire length and the other, or fœtal portion, of 5 to 6 cm. length. The latter was thin and became more so as it neared the umbilicus. The most striking feature was, however, the way in which the cord was twisted. The large portion of it was hardly twisted at all. The small fœtal portion was markedly twisted and particularly near the umbilicus. It had the appearance of having had the normal twisting prevented throughout the whole length, and only allowed to occur in the short fœtal part where it was hence much exaggerated.

It seems that this twisting may have caused an arrest of the funic circulation. Unfortunately it was not possible to investigate this by injections. Microscopical examination of portions of the twisted part of the cord was made. This revealed a condition of narrowing of the umbilical arteries and thrombus formation within them as though they had been ligatured. The umbilical vein was normal. L.G.

Marked deformities of the lower extremities following birth from a bicornute uterus.

KALMANOWITSCH (*Gynæk. Rundschau*, 1913, Hft. 14). The patient, a primipara with a negative history, gave birth to a child with marked flexion of the lower extremities on the abdomen and also double talipes equino-varus. On examination the uterus was found to be bicornute. The child presented as a breech, the head lying in the larger portion of the fundus.

The author discusses the possible causes of such deformities and mentions the probable treatment. R.M.A.

Two cases of severe septicæmia cured by antistreptococcic serum and fixation abscess.

FUNCK-BRENTANO and ROULLAND record three cases (*La Gynécologie*, April 1913) at great length. The first patient was a primipara, 22 years of age: after confinement she became septic and a considerable quantity of foul débris was curetted away after which the uterus was swabbed with iodine and hydrogen peroxide. Intra-uterine douches were administered daily and intra-muscular injections of electrargol, with marked benefit for a time: the patient then became worse and suffered from vomiting. Camphor and spartein were administered without benefit. The patient gradually grew worse till about seven weeks post partum two cc. of turpentine were injected without any reaction following. Three days later anti-streptococcic serum was injected by Pinard's method, 240 cc. in six doses given night and morning. The patient's condition was now desperate and the day following the last streptococcic injection turpentine was again administered. Five days later a considerable quantity of pus was evacuated. Recovery could not be said to be established till fully four months after her confinement and the muscles of the front of both legs are paralysed. The turpentine injections were both on the front of one thigh.

In the next observation the patient was a ii-para delivered on January 1. There was an atonic uterus post partum, with a considerable amount of hæmorrhage requiring massage and hot douching. On the fifth day she shivered and the temperature rose. On the seventh day she was curetted; this was followed up for four successive days by an injection night and morning of Roux's serum. Three days later électrargol Clin was given night and morning to the extent of 10 cc., and continued for six days.

On the 25th day 3 cc. of turpentine were injected subcutaneously in the left thigh but without reaction: on the same day and on the four following days 30 cc. of Roux's anti-streptococcic serum were injected. On the 31st day a second turpentine injection was administered and produced violent reaction, requiring morphia to ease the pain; next day the abscess formation had begun and the whole aspect of the case had changed and the general conditions improved—cessation of vomiting, etc. On the 37th day the abscess was evacuated and improvement continued. By the 1st April the patient might be considered quite cured.

In both these patients ordinary treatment had failed and in both cases turpentine injections failed to cause reaction until the patient had been brought under the influence of the anti-streptococcic serum. The authors of this paper accordingly highly recommend the adoption of this method of combining the two forms of treatment—turpentine and anti-streptococcic serum. E.H.L.O.

Gangrene of the uterus secondary to abortion.

BICHAT (*Bulletin de la Société d'Obstétrique et de Gynécologie de Paris, etc.*, No. 4, April 1913) records a case of extensive uterine gangrene post abortum in a girl of 19. He was called in to see the patient on the fourth day following a four months' abortion on account of her serious general condition. General peritonitis was present and Bichat advised immediate operation. At the laparotomy half a litre of extremely fœtid fluid escaped from the peritoneum. The uterus was soft, deep red in colour, with two large gangrenous areas on the anterior wall and fundus of the organ. A small perforation appeared in the centre of one of the areas but the writer thinks that this was the result of necrosis rather than previous trauma. Hysterectomy was performed but the patient succumbed the day following operation.

In discussing the case the writer observes that everything pointed to criminal abortion, but no history of any intervention could be obtained, even upon the most careful questioning. The patient herself absolutely denied any previous interference.

The extensive area of gangrene seemed to preclude lesions which might be produced from perforation of the uterus by some instrument. The suggestion which Bichat puts forward is that some extremely caustic fluid, *e.g.* corrosive sublimate, or some very septic liquid had been injected into the uterus. This would account for the large size of the necrotic areas.

At operation a point of interest was the extensive thrombosis that existed in the uterine and ovario-uterine veins. The calibre of the arteries was also considerably reduced. H.B.W.

REVIEWS OF RECENT BOOKS.

"A Text Book of Obstetrics." By Barton Cooke Hirst, M.D. W. B. Saunders Co., 1912. Pp. 1013. $5.

In this publication this well-known book has reached its seventh edition. It has been enlarged, the order of the contents has been re-arranged, new illustrations have been added, and the article on Diseases of the Breast is extended. The result is that the reader will find a well, full of accurate and recent observation and knowledge, from which he can draw the account of modern American midwifery in all its detail and extensions to allied sciences.

To differentiate the parts which are best in a work so wholly good is not easy. In its perusal one's interest is most claimed by the splendid series of pictures with which the book is replete. These alone form a pictorial text-book. Many of them are reproductions of actual photographs of the diseased parts or of methods of procedure. Others have been made, by the aid of colours, to give a mental impression only excelled by the actual object itself. Another engrossing part of this work is the historical survey preceding most sections and leading up to present day ideas and practice.

With regard to matters in dispute, as for example the treatment of eclampsia, the author has given a fair account of the opinions of other authorities, though at the same time he reserves his own teaching as being the main-spring for the definite and dogmatic course to pursue in the individual case. In support of this it is easy to see that his reasons are based on that surest of foundations, clinical experience.

It is to be noted that mammary conditions, apart from those peculiar to pregnancy, are included in this edition. Though doubtless such cases do come before the obstetrician, he will be advised better to consult the usual text-books of Surgery relative to them. When the treatment of such a condition as carcinoma mammæ is given by means of three illustrations and but ten lines of directions, it is fairly open to question whether such a brief description would not have been better spared altogether from a book which otherwise is so full of precise information. L.G.

"A Text-book of Midwifery for Students and Practitioners." By R. W. Johnstone, M.A., M.D., F.R.C.S., M.R.C.P.E., Assistant to the Professor of Midwifery in the University of Edinburgh; Physician Accoucheur, New Town, Dispensary; Extern Assistant Physician, Royal Maternity Hospital, etc. Crown 8vo. Pp. 485. Illustrations 264. London: Adam and Charles Black, 1913. Price 10/6.

The author has successfully compressed into a small compass the modern theory and practice of midwifery, and we find the book eminently readable and practical. Seeing however that successful modern midwifery depends so largely upon examinations and deductions made during pregnancy, preferably at about the thirtieth week, we should have liked to see a much longer special paragraph or even a whole chapter on this subject. As a matter of fact this subject is dismissed in thirteen lines of special paragraph,

though of course it is referred to again in connection with contracted pelvis. The greatest advance in modern teaching may be termed prophylactic midwifery and it cannot be too clearly or too often impressed upon students. The practice of lying-in hospitals all over the kingdom still demonstrates how difficult and dangerous midwifery can be avoided, if every practitioner would insist upon making at least one examination during pregnancy at the time suggested above. The earlier chapters of the book on anatomy, embryology, physiology of pregnancy, etc., leave nothing to be desired, and the same may be said as regards the physiology and management of normal labour. With regard to abnormal positions of the fœtus and the management of labour in them a few minor criticisms occur to us, which however do not detract from the general sound principles which the author advocates. For instance if a face presentation is caused by a flat pelvis, the author suggests that the treatment "would be at once modified in favour of early bipolar version." This is a misleading statement, because clearly the treatment must be modified according to the disproportion between the head and the pelvis, and Cæsarean section would have to be considered in some cases. Further, the more experience one has of contracted pelvis the more one is impressed by the very limited application of version as a means of delivery. The same criticism applies equally to brow presentations.

We should have liked to see the *actual* cause of "impaction of the breech" mentioned, namely the *failure of lateral flexion to occur* owing to extended legs, etc., as mentioned by the author. If the failure of some part of the mechanism of labour can be thus brought home to the student, the mechanism itself is emphasized and some interest is imparted to its otherwise dry details. Again, "impaction of the after-coming head" is said to be "in most cases . . . due to traction on the breech and the omission of supra-pubic pressure," but surely it is *really* due to extension of the head either above the brim, or in the pelvic cavity. If this is made clear the method of dealing with it is readily understood.

The toxæmias of pregnancy, abortion, extra-uterine gestation, pelvic contraction and the hæmorrhages of pregnancy and labour, are all clearly described and the details of their treatment are above criticism.

The chapter on injuries of the genital tract contain no mention of the various fistulæ, in fact the only mention of them we can find on referring to the index, concerns their occurrence in connection with contracted pelvis, but no details are given.

Perhaps the best chapters in the book are those on the obstetric operations, particularly the forceps, as we should expect from a member of the school which has done so much for the evolution of the forceps.

We do not quite agree that hydrostatic bags are "not very suitable for use in private general practice" for the induction of premature labour. The author, we think, does not emphasize sufficiently the uncertainty of Krause's method. Five or six days is no uncommon period to elapse before labour commences when bougies are used. Whereas a small hydrostatic bag, such as Horrocks' maieutic bag tied on a large catheter is just as easy to sterilise and to introduce, and rarely takes more than twenty-four hours to start labour pains.

The general arrangement of the book, the printing and illustrations are excellent, and we congratulate the author on having produced an eminently practical work. T.G.S.